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THE CONCENTRIC WIRING SITUATION.

Matters have been moving briskly with regard to the adoption of measures on the part of the electrical industry to meet the issues involved in a proposed introduction of the concentric system of wiring in the United States. It will be remembered that a meeting of a number of manufacturers of standard two-wire devices was held at the Biltmore Hotel, New York City, on December 22, 1914. Out of this meeting there was evolved a General Committee of Electrical Interests. A special committee was appointed from among the members of the general committee to confer with a Sub-Committee on Concentric Wiring appointed by Mr. F. E. Cabot, chairman of the Electrical Committee of the National Fire Protection Association. These two committees were in conference in New York City on January 1. A full report of the proceedings of the conference is published on other pages of this issue. This report indicates that there is apparent a pressing demand by the electric lighting interests of the country to utilize an inexpensive system of wiring. Investigations made by the Committee on the Wiring of Existing Buildings of the National Electric Light Association have elicited statements from various communities that a considerable portion of unwired existing buildings would be readily attracted to central-station service if this inexpensive system of wiring were available.

So much for the central-station side of it. The proponents of the concentric wiring system as an inexpensive method of wiring interiors of certain classifications are sincere in their expression of faith in the system and belief that it constitutes not only a cheap system of wiring but a safe system of wiring. On the other hand those opposed to the concentric system of wiring are sincere in their belief that the concentric system of wiring presents a hazard which should not be allowed. Both are right. If the concentric system is installed as Mr. Blood, for instance, would have it installed, it is undoubtedly a perfectly safe system. If, on the other hand, the concentric system of wiring is installed as there is great possibility for it to be installed by persons unacquainted with the hazards of indiscriminate and inexpert wiring, remote from the intelligence and vigilance of the inspector, it is an unsafe system of wiring.

The report indicates, however, that in its desire to secure an inexpensive and safe system of wiring the proponents of the idea are not wedded to any

particular system of wiring. What they want is an inexpensive system of wiring which will allow them to get energy to the small consumer who apparently is not now available with the present standards of interior wiring construction. In seeking this inexpensive system of wiring it is admitted that the present standard must be departed from, but no class of interests is more anxious to safeguard these installations against life and property hazard than are the electric lighting interests of the country.

Between the several interests involved there must be a middle course to which all may subscribe. The action taken at the meeting at New York on Tuesday of this week, and which is fully reported on other pages of this issue, is a means toward this end.

In the meantime it can be assumed that the interests of all will be well conserved. There is not much ground for the fear that any particular interest will play football with the industry. If a cheaper system of wiring is to be developed the industry as a whole will have an opportunity to participate in the development of this system if it cares to do so.

With regard to the imminence of unqualified approval of hazardous devices and the imposing of these on unguarded circuits, it may also be assumed that with the record of achievement behind the Underwriters' Laboratories, Incorporated, it will not contribute to such a condition. This excellent institution is not in the habit of doing things hurriedly or carelessly. We believe that the matter should continue to have the careful investigation that has been given to it during the past few weeks. If there is an opportunity for the manufacturers and the other interests involved to co-operate in the development of an adjunct which will increase the general utilization of electrical energy and current-consuming devices we expect this to be worked out amicably and to the ultimate mutual interest of all concerned.

A UNIVERSITY COURSE FOR BUSINESS MEN.

Elsewhere in this issue will be found an announcement of a one-week course offered by the University of Illinois to men already in business occupations, with the object of broadening their knowledge and familiarity with general business principles and best modern practice. This course is an innovation in University work and should appeal to business men who have grown up in the narrow field of one particular line of business and who wish to extend their familiarity with the methods in use by others. Perhaps no class of business men is more in need of such a course than the electrical contractors, taken as a class. Much stress has been laid of late in this field upon such items as proper cost-keeping, realization of what constitutes overhead expenses, the best manner of handling casualty insurance, etc. There are many wider business questions, however, which are also important, such as banking methods, credits and collections, and salesmanship, in which lines a more extensive knowledge would be of great service. This course will involve no more expense than railroad fare and board at the University, and the time required will be no more than is frequently taken in attending a convention, while the results should be of great value. The course is not limited to citizens of Illinois.

PROPER ILLUMINATION INTENSITIES.

Illuminating engineers have given considerable attention to the proper illumination of buildings and rooms from artificial sources, taking into consideration the particular uses to which individual rooms are to be put. It is generally recognized that illumination requirements differ according to the work which is to be done. Thus where it is necessary to discern detail a higher intensity will be required, since it is well known that up to a certain point the visual acuity increases with the intensity of illumination. In large rooms or auditoriums, where it is necessary to see at a considerable distance, it is also necessary to have higher illumination than where vision is entirely at close range.

Values have frequently been tabulated, giving intensities of illumination recommended for rooms devoted to various specified uses. It should be remembered in this connection that the light reflected to the eye by any surface depends upon the reflecting power of that surface, and consequently the same illumination intensity upon surfaces of different quality will produce different effects, so far as seeing is concerned. The proper intensity of illumination consequently depends upon the general color scheme of a room, and the other properties of its exposed surfaces. To a certain extent this can be taken care of in such tables as those above referred to, since the general fittings in a butcher shop will be of one kind, in a millinery shop another, and in a type-setting room still another. It cannot be assumed, nevertheless, that a typical value will be suitable for any individual installation coming in a given class, since there will always be individual variations in the surface conditions.

The ability to see depends not only upon surface brightness, but upon contrast between the different surfaces which the eye is expected to perceive. Such contrasts in any given room are consequently of equal importance with the individual characteristics of the separate surfaces. White objects against a black background can be seen readily under a very low illumination; whereas brown objects under the same conditions would require a high intensity.

The above is sufficient to indicate that in planning the illumination for any particular case, tabulated values recommended by authorities, however good, should not be implicitly followed, but should be regarded as average values which may require modification according to local circumstances. Unless these limitations are kept in mind, the reference to such tables may prove a detriment rather than a help in planning a particular installation.

RENTING MOTORS FOR SEASONAL APPLICATIONS.

The all-around fitness of the induction motor for constant-speed industrial service suggests the desirability of investigating the possibilities of the maintaining of equipment of this kind by central stations for use in industries having a seasonal power demand. There are certainly opportunities in this direction which will bear looking into. Where a nominal rental can be collected for the use of motors in this way, so much the better.

Why should a motor which drives an ice-sawing machine during the harvesting season stand idle the rest of the year, when it might be turned to good account in a small refrigerating plant in the summer and perhaps utilized in farm work during the late autumn? By many small manufacturers electric power would be utilized if it were not for the first cost of motors which in many cases can be turned to account only during stated seasons. The study of possible costs for supplying motor service on the lending or rental basis is well worth making in the spare hours of the new-business manager. The relations between the cost of maintaining a small stock of standard motors and the revenue obtainable from them when judiciously distributed among industries none too well noted for efficient power development may be known to a few engineers, but the data have not been generally disseminated. We throw out the suggestion for what it is worth, and feel sure that it can be worked out in an interesting manner by a good many local managers if they care to make the effort. Some allowance should be given to the advertising value of this kind of service in weighing its merits, which are as yet but little appreciated.

SWITCHING SURGES.

The existence of high-voltage surges on alternating-current lines whose currents are suddenly interrupted, and of large current surges where voltages are suddenly applied, is well known, and a number of investigations, both theoretical and experimental, have been carried out in this field. There is a somewhat widely diffused impression that an air-break switch is likely to give rise to greater disturbances than an oil switch under the same circumstances, owing to the ability of the latter to interrupt the current at the point in the cycle where it is passing through the zero value.

That the contrary is the case is stated by a German experimenter, Dr. W. Linke, who published some oscillograms in the *Elektrotechnische Zeitschrift* last year to substantiate his claim. This is especially true if the air-break switch is provided with horns to take care of the arc at the moment of break.

The same author shows that the current rush on closing a transformer circuit may be as large as 120 times the normal exciting current, or about 10 times full-load current. This may be greatly cut down, however, by providing on the switch an auxiliary contact point connected through a resistance.

These are points which may well be kept in mind by designers. While the heating effects of large surges are negligible, owing to their short duration, the mechanical forces brought into play, and the liability of actuating automatic cutouts, are worthy of attention.

ENCOURAGING FIRST-CLASS INSTALLATIONS.

In providing estimates for prospective customers, the electrical contractor, when dealing with the individual house-owner, should point out the differences in cost for different classes of wiring, and never assume that the customer desires the cheapest kind of an installation. Where the advantages of better work are properly presented, the majority of customers will order it in preference to the cheaper methods. Frequently they do not do so, however, owing to a lack of appreciation of the real differences involved in the work, which the contractor has neglected to fully explain to them.

Especially in already-built houses, if rigid conduit is out of the question, a flexible conduit or armored conductor should always be advised in preference to knob-and-tube work. The former construction has the advantages of being more permanent, of requiring less tearing up of floors and walls, of being fool-proof, and of being safer as regards the hazards of fire and shock, damage from rats, etc.

The question of the general method of wiring having been settled, suggestions should be made regarding details which will affect the cost to some extent, but regarding which a slight added expense is always worth while when the benefits of appearance, convenience, etc., are considered. Thus the position of the service entrance, the meter, and the main switch should be considered, the basement having usually been found the most convenient location for these. A standard meter board is usually worth the expense which it involves. It should always be pointed out that future requirements are likely to exceed present needs, and that provision should be made for heating devices which may later come into use, and possibly for extensions. This means a sufficiency of wall and baseboard outlets, and leads of sufficient carrying capacity for all future requirements. It also means the provision for a larger number of circuits than would be necessary if the entire present load were crowded on to the minimum number permitted by the rules.

The question of switching should receive detailed attention, as the great convenience of controlling hall lights, and even certain of the rooms, from more than one point is well worth the expense involved. The general use of wall switches should be encouraged. Suggestions regarding the provision of lights in places that might otherwise be neglected, such as closets and pantries, should not be overlooked.

By taking up all of these details with his customer, the contractor will do a service which will be appreciated in the future, which will enable him to do a job that he can refer to with pride and satisfaction, and which will, at the same time, usually increase the size of his contract.

Meeting and Dinner of Railway Men.

Arrangements are being rapidly completed for the mid-year meeting of the American Electric Railway Association and the joint dinner of this organization and the American Electric Railway Manufacturers' Association, both of which are to be held in Washington on January 29.

The meeting proper will convene at 10 a. m. in the assembly room of the New Willard Hotel and the following speakers have accepted assignments:

Dwight W. Morrow, of J. P. Morgan and Company, who will discuss electric railways from the banker's standpoint.

N. C. Kingsbury, vice-president of the American Telephone & Telegraph Company, who will speak upon publicity; T. S. Williams, president of the Brooklyn Rapid Transit System, whose subject will be the Code of Principles adopted by the Association at its last convention.

At 2 o'clock the delegates will be received at the White House by President Wilson and at 7 p. m. the annual dinner will take place at the New Willard Hotel. While the speakers for this affair have not been announced, men of prominence in national governmental affairs will be included and in addition Arthur Williams will announce the winner of the Anthony N. Brady medal offered for the electric railway which has done the most during the year to conserve the life and health of its passengers and employees. C. L. Henry, president of the Indianapolis & Cincinnati Traction Company, will speak from the railways' standpoint and C. Loomis Allen, president of the Association, will act as toastmaster.

A special Transportation Committee, of which Bertram Berry, of New York, is chairman, has made arrangements for a special train to leave the metropolis on the night preceding the dinner for the convenience of New York delegates desiring to attend. The transportation arrangements in Chicago are in the hands of H. J. Kenfield and the Committee has appointed representatives in St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia and other centers.

Owing to the unsual excellence of the program a large attendance is expected.

Chicago Vehicle Meeting.

The construction and operation of the Martin rotary converter for battery charging was described by E. B. Forslund, of the Northwestern Electric Company, at the meeting of the Chicago Section, Electric Vehicle Association of America, on January 12. The Martin converters made in sizes ranging from one-tenth kilowatt to 50 kilowatts, combine the advantages of simplicity and economy of the squirrel-cage motor and direct-current generator without the loss in efficiency where motor-generator sets are used.

Mr. Forslund spoke of their application in private garages and also in public garages in connection with the constant-potential system of charging. Various views of the equipment were shown by means of lantern slides.

Annual Meeting of Chicago Electric Club.

Over 500 members and guests of the Electric Club of Chicago assembled at the Hotel La Salle, on the evening of January 7, the occasion being the annual meeting of the organization. Remarks were made by A. R. Bone, retiring president, and W. R. Pinckard, the present incumbent. Mr. Pinckard forecast a prosperous year and favored the merger of the club with the Chicago Jovian League. Reports were presented by F. W. Harvey, Jr., the retiring treasurer, and Howard Ehrlich, retiring secretary. The latter showed the present membership to be 638. A vaudeville entertainment followed.

New Officers for Chemical Engineers.

At the annual meeting of the American Institute of Chemical Engineers the following officers were elected: George D. Rosengarten, president; J. M. Stillman, vice-president; J. C. Olsen, secretary; F. W. Frerichs, treasurer.

The next meeting will be held in San Francisco, Cal., in September.

Utility Employees to Give Benefit Show.

Employees of three of the large public utility companies of Chicago, the Commonwealth Edison Company, Chicago Telephone Company and the Peoples Gas Light & Coke Company, will give a minstrel show at the Auditorium Theater, February 9, 10 and 11. The entire proceeds will be given to charity.

Professor Comstock Lectures at Lynn.

In the lecture course under the auspices of the Lynn Section, American Institute of Electrical Engineers, Prof. D. F. Comstock, of the Massachusetts Institute of Technology, on January 6 spoke on "Modern Views of Electricity." The speaker first took up the atomic theory, and stated that matter is, without doubt composed of atoms so minute that the most powerful microscope is unable to reveal them. But smaller by far than the atom is the electron, of which thousands would be required to make one atom.

Professor Comstock gave an interesting resume of the most recent researches into the question "What is electricity."

Free Short Business Course at University of Illinois.

The University of Illinois, Urbana, Ill., will offer a short course in business during the first week in February. There are no requirements for admission to this course and no fees will be charged. The courses are designed to afford those already in business an opportunity to broaden their knowledge of fundamental business principles, and get information regarding best practice. The work is given by members of the regular staff of the courses in business administration, supplemented by lectures by men in allied departments.

The course will include lectures on Accountancy, Banking, Credits and Collections, Salesmanship, Insurance, Legal Subjects, Railway Administration, Municipal Problems, and Industrial Illinois. There will also be some special lectures on other topics.

For further information apply to the Director of the Courses in Business Administration, at the University.

Night Courses in Electrical Engineering at Washington University.

Evening courses in electrical engineering will be offered by Washington University, St. Louis, Mo., commencing January 18:

There will be two courses which will continue for 18 weeks. One will cover the principles of direct and alternating-current machinery and the other general electrical engineering practice. Both courses will be open to youths and men more than 18 years old, but the first named course is for men familiar with algebra and who have an understanding of physics or experience in the handling of machinery.

A. S. Langsdorf, professor of electrical engineering and dean of the School of Engineering, and Assistant Professor H. G. Hake will conduct the advanced course.

Terrell Croft, consulting engineer and author of "The American Electricians' Handbook," will conduct the other course, arranged on the assumption that the student may have little or no previous knowledge of electricity. The only entrance requirement will be a knowledge of arithmetic.

It will start with an explanation of the use of formulas and a discussion of the important engineering terms and units. It has been designed particularly to afford a medium whereby men engaged in electrical pursuits for a livelihood and who have not had the advantages of a technical education can obtain a working knowledge of the essential electrical laws.

The course will be of equal interest to others, not connected with electrical industries.

Electricity in Magazine Publishing.

This article describes the electrical installation in a modern magazine-publishing plant, wherein individual motor drive is employed. The elaborate control equipment for the presses is a feature of the installation.

The publishing of a magazine presents some problems of power service not involved in the ordinary printing and publishing business. Of necessity, the element of prompt and expeditious execution enters in, and the demands of promptness make it desirable to include the process of binding with those of composition and presswork, to be done on the premises.

The publishing plant of the *National Magazine*, of which the Chapple Publishing Company is the proprietor, is one of the most efficient and complete magazine plants in the country. It is housed in a building recently erected by the company for its exclusive use, and providing every desirable feature, of light, air, and commodiousness. The structure is located on Dorchester Avenue, in the Dorchester district of Boston, Mass., and in connection is a power plant providing direct current from three generators operated by gas engines. The power station is located in the yard in front of the main building, and is soon to be remodeled into the form of a Gothic chapel, thus giving a witty play on the name of the firm, and at the same time recalling that the earliest publishers had their headquarters in cathedrals.

Group of Motor-Driven Job Presses in Plant of Chapple Publishing Company.

The use of direct current provides for the operation of motors of the variable-speed type in connection with all the presses. The first floor of the new building is given over in large part to the pressroom, and is constructed with a concrete floor, heavily reinforced under the presses, and provided with lines of iron conduit, for power leads, having outlets through the floor for connections with the motors, all laid out in advance.

An interesting feature of the motor installation is the guard provided in front of the motor and flywheel of each press. Holes were bored in the concrete floor, two for each standard of one-inch iron pipe, which is affixed thereto on iron pivots, a brace rod bolted to the step of the press holding it in place. The frame is covered with one-inch mesh netting. The guard being secured by a single bolt, is easily removed from its place on the pivots, in case it is necessary to work on the mechanism behind it.

The pressroom contains two Cottrell rotary presses, for magazine work, besides nine Miehle presses for general printing, cover work, etc. One of the Cottrells is equipped with the Kohler starting system in connection with a Cutler-Hammer controller. The latter is installed on a slate panel in a convenient position above the 15-horsepower Sprague motor which drives the press and a folding machine in connection. The Kohler system provides four push-button stops, besides the main starting, stopping and inching device. Other cylinder presses in the shop, including the other Cottrell rotary, are equipped with a shop-made push-

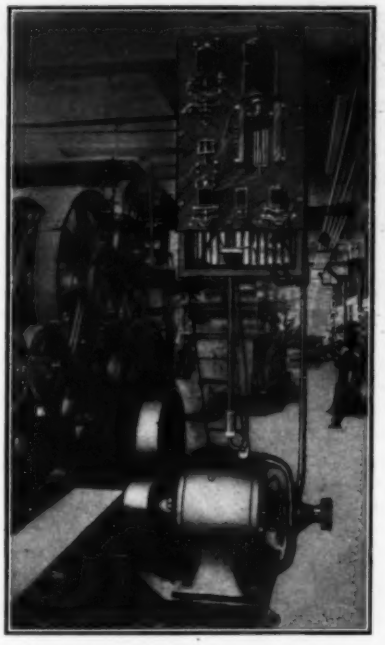
button stop, connected up with a circuit-breaker over the starting-box releases. Two buttons are provided in the case of the rotary, one on either side of the folder which is attached to the delivery of the press. The conduit for the connections is run under the frame of the press. All connections from the outlets in the floor are carried to motors and starting apparatus in armored cable. The installation throughout is in strict accordance with the Underwriters' rules and regulations.

Two quarter-horsepower Holtzer-Cabot motors are installed on blowers in connection with Dexter pile feeders, to supply air to lift the sheets of paper as they are fed. A two-horsepower Sprague motor supplies compressed air to the Monotype keyboards. There are four casting machines, each separately motored with one-horsepower motors installed on the frame of the caster.

Each of the four job presses, used for office stationery and advertising printing, is separately motored, the motor standing on a wooden base at the back of the press, and the starting box located conveniently just beneath the delivery table, or on a standard beside the feed table.

The bindery equipment consists of Boston and Jersey stitchers, each operated by its individual small motor, and a Christiansen gang stitcher equipped with Boston stitcher heads, operated by a one-horsepower Sprague motor, which enables the machine to perform the double operation of gathering and binding.

For the attaching of covers, melted glue is essential. This is provided by means of four glue pots which set in receptacles containing water that is kept at near the boiling point by Simplex electric coils. A pilot lamp is installed on each circuit to indicate whether the coil is in operation, as required by the Underwriters' regulation.

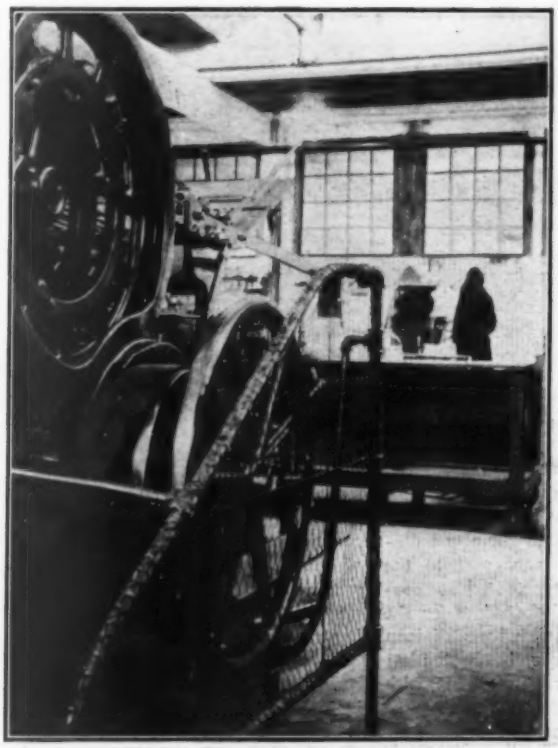


Cottrell Press Driven by 15-Horsepower Motor Equipped with Push-Button Control.

Lighting for the establishment is provided by an ample number of 32-watt Mazda lamps operated on the 220-volt direct-current service. Over stones and frames the lamps are pendent on cords which bring the lamp and its metal reflector to a height just outside the workmen's range of vision. Over the bindery floor, and in general over the pressroom, a general lighting scheme is carried out, the lamps being two to three feet below the ceiling and about 12 feet above the floor. A Blake Electric Company switchboard, of slate, and encased in a sheet-metal closet, controls all the power and lighting circuits, a total of 26, through double-knife switches. The switchboard is located on the first floor between the bindery and the pressroom, and in convenient reach of each department.

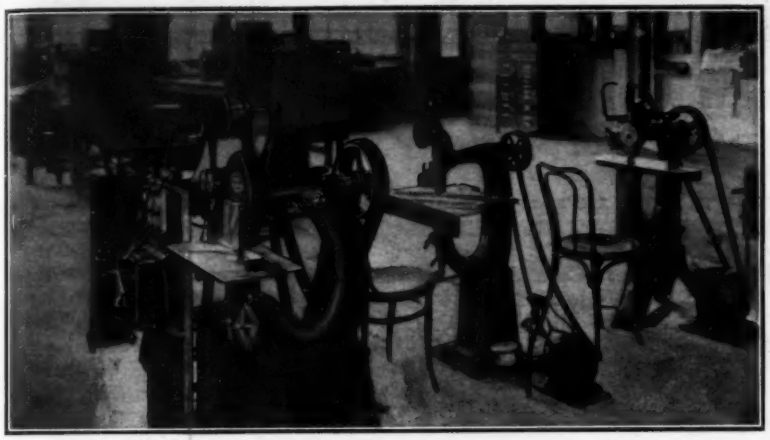
Power for the plant is generated in the building in the yard, already referred to. The plant consists of a 65-horsepower Bruce-Macbeth gas engine direct-connected to a Crocker-Wheeler generator rated at 35 kilowatts, 250 volts; and two units comprising each a 27-horsepower Bruce-Meriam-Abbott engine and a 20-kilowatt Holtzer-Cabot generator direct-connected.

The full load of the publishing plant, including lighting, requires the operation of the three generators simultaneously, but ordinarily the largest and one of the smaller generators together do the work required, while one of the 20-kilowatt generators alone is operated to meet the demands of night work. Under average conditions the monthly gas bill runs to something like $150, on the rate given



Shop-Made Protecting Shield for Cylinder Press.

Shop-Made Push-Button Control for Cylinder Press.



Group of Motor-Driven Stitchers.

for consumption in fairly large units. The advantages of central-station service are, however, recognized, and may be embraced at some time in the near future.

In the generating station an air pump is operated by a one-horsepower motor for the triple purpose of supplying air for starting the gas engines, for blowing the factory whistle and for supplying air to automobile tires.

Operating Data.

The Chapple Publishing Company, Dorchester, Boston, Mass., publishers of the *National Magazine* and other publications.

Total connected horsepower, 100.045.

Total number of motors installed, 38.

Motor Installation.

The following is a list of the motors, with their respective drives. The energy supply is direct current at 220 volts. Speed range of motors, around 900 revolutions per minute.

No.	Horse-power.	Application.
1	15	Belted to Cottrell rotary press and folder.
1	12	Belted to Cottrell rotary press and folder.
8	5	Belted to 8 Miehle cylinder presses. Sizes up to 44 by 64-inch bed.
1	3	Belted to Miehle cylinder press.
1	0.33	Operates blower to Dexter pile feeder.
1	0.25	Operates blower to Dexter pile feeder.
1	2	Belted to re-winding machine for tympan sheets.
1	0.50	Belted to re-winding machine for tympan sheets.
1	1.50	Belted to Prouty job press, 10 by 15-inch chase.
1	0.50	Belted to Golding job press, 10 by 15-inch chase.
1	4	Belted to Victoria embossing press, 15 by 20-inch chase.
1	1	Belted to Gordon job press, 14 by 20-inch chase.
1	1	Belted to air compressor for monotype keyboard operation.
4	1	Operate four monotype-casting machines.
1	2	Belted to 44-inch Seybold paper cutter.
1	2	Belted to 40-inch New Ideal paper cutter.
1	1	Belted to Christiansen gang stitcher.
1	0.33	Belted to Morrison stitcher and Wallace addressing machine in combination.
1	0.25	Belted to Jersey stitcher.
1	0.125	Belted to Boston stitcher.
1	2	Belted to job folder.
1	2	Belted to quadruple 16 folder.
1	2	Belted to double 16 folder.
1	1	Belted to air compressor in generating station.
1	0.50	Operates Miller cut-off saw.
1	1.75	In service in composing room.

Safety Campaign Inaugurated in Columbus.

Over 100 employees of the Columbus (O.) Railway, Power & Light Company met the first week in January to launch a big "safety-first" campaign. A complete organization was effected for safety work in all the departments of the company. President McMeen and other officials made addresses. A central committee selected includes the heads of all departments of the company, and sub-committees will embrace the minor officials at power houses, barns and shops. Every employee is to be instructed in observing and reporting the nature and causes of accidents they witness and suggest a possible remedy. Warnings and suggestions are to be posted on bulletin boards in all shops and offices of the company, and a constant effort will be made to eliminate features dangerous to employees, customers and passengers. A program worked out in connection with the public includes talks to passengers by means of posters on cars, co-operation with teamsters and auto drivers and educational efforts among school children. Frequent get-together meetings will be held by these various committees. It is announced that the company expects by such means to decrease the number of accidents by from 30 to 60 per cent.

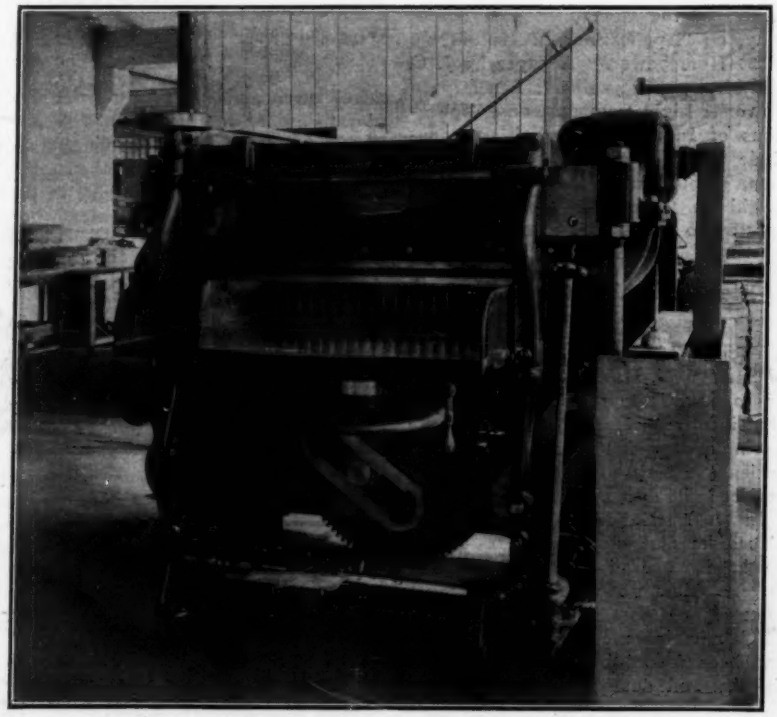
New Contract for Street Lighting in Chattanooga.

A new contract for the lighting of the streets of Chattanooga, Tenn., became effective in December. Under this contract there will be an increase in the number of lamps and a decrease in the cost. The 425-watt, 6.6-ampere inclosed arc lamps will be entirely replaced with 250-candlepower nitrogen-filled incandescent lamps.

The flaming arc lamps heretofore used will be continued. They are rated at 500 watts and 6.6 amperes. The cost to the city will be $65.00 per year. Luminous arc lamps will continue to be used on the Great White Way. These have the same rating as the flaming arc lamps. The cost for these is $45.00 each per year.

Inclosed arc lamps that remain in use will cost $60.60 each per year.

The 250-candlepower Mazda lamps will cost $26.00 to $26.25 each per year, according to the number in use. All except White Way lamps burn all night.



Paper Cutter Driven by Two-Horsepower Motor.

Commercial Practice
Management, Rates, New Business

Program of Meeting of Ohio New-Business Men.

In our last issue there appeared a tentative program for the quarterly meeting of the Committee on New Business Co-operations of the Ohio Electric Light Association, to be held at the Hollenden Hotel, Cleveland, O., January 20. Full details of the program have since been announced by Thomas F. Kelly, chairman of this committee.

The meeting will be opened at 10 a. m. with an address of welcome by Mathias Turner, of the Cleveland Electric Illuminating Company. This will be followed by a paper illustrated with slides, by T. E. Simpers, of the Westinghouse Electric & Manufacturing Company, on "Application of Electric Drive in Flour Mills." Luncheon will be served at 12:15 at which there will be an address by Morris A. Black, president, Cleveland Chamber of Commerce.

At the afternoon session there will be a paper by W. A. Wadsworth, Union Gas & Electric Company, Cincinnati, on "Securing Business With the Nitrogen Lamp." This will be followed by a paper, illustrated with slides, by L. E. Smith, of the General Electric Company, on "Applications of Motors Up to 25 Horsepower." A paper by J. C. Matthieu, power engineer, The Dayton Power & Light Company, on "Applications of Industrial Trucks," will conclude the program. Central-station men, manufacturers and others from neighboring states are urgently requested to attend this meeting.

Electric-Vehicle Campaign in Springfield.

The United Electric Light Company, of Springfield, Mass., is urging its public to investigate the electric automobile, in advertisements inserted in the Springfield papers, reciting its own experience in adopting this type of car for service in its distribution department.

In 1907 the Springfield company placed its first electric, a 1,000-pound truck, in operation for distributing meters. Now it owns 15 electrics, rang-in capacity from 1,000 pounds to 5 tons.

After having used gasoline trucks, it has been forced by the economy, reliability and durability of the electric to make the change, the company says.

Trade-Mark of Columbus Company.

The accompanying illustration shows the "service" trade-mark which has been adopted by the Columbus (O.) Railway, Power & Light Company, and which is featured in all of its advertising and publicity work. As a test of the impression that such a trade-mark would make upon the public, F. A. Wolls, commercial manager of the company, decided, after an extensive newspaper-advertising campaign to omit the company's name and address from the advertisements, simply using the trade-mark. No difference was noted in the number of replies and inquiries when publishing the name and address and when using the trade-mark alone so that the value of the trade-mark was clearly established.

Trade-mark of Columbus Railway, Power & Light Company.

An amusing incident in connection with this test was the receipt of several letters and telephone calls criticizing the advertisements as a waste of money because the public would not know the name of the company advertising. When these critics were answered with the question, "How did you know whose advertisements they were? they were at a loss for an answer.

Louisville Salesmen Work on Commission Basis.

The salesmen of the Louisville Gas & Electric Company, working under Robert Montgomery, manager of the commercial department, went to work on a strictly commission basis on the first working week this year, having heretofore been employed on salaries while the company was pushing its house-wiring and gas-appliance campaigns. Now, however, the city has been worked over to the extent that the commission plan is considered the better one.

Each of the men is a combination solicitor, selling all kinds of service which the company supplies and by this means it will be possible for them to keep going all the year through, selling wiring contracts in the summer time and gas heating appliances in the winter with power, nitrogen lamps, etc., whenever opportunity offers.

The field remains a big one in Louisville yet, Mr. Montgomery points out, with probably 30,000 of the 50,000 houses in the city yet to be wired. Last year the house-wiring contracts ran to something in excess of 2,000 and one man turned in 570 contracts. The average cost of wiring is in the neighborhood of $39 a house and the plan by which the work is divided among the eleven contractors of the city by the company will still obtain.

Instruction for Central-Station Employees in Boston.

Educational courses for the mental development of the company's employees, have been outlined by the Education Committee of the Boston Edison Company's Welfare Bureau. The proposed courses consist of arithmetic, 16 hours, one hour a week; salesmanship, 40 hours, two hours a week; care and handling of apparatus and material, 12 hours, one a week; first aid and hygiene, one hour weekly for ten weeks; advanced shorthand and office routine, 20 hours, one each week; penmanship, 20 lessons; and debating and public speaking, 24 hours, in ten sessions. All the courses given will be on the company's time, either during the working day or else in the evening, in which case the employee will be allowed an equivalent amount of time off duty. Instructors are provided by the company, and the only cost to the employee will be the price of a text book in certain subjects. It is estimated that 25 to 33 per cent of the employees in each department will take one of the courses.

Newspapers Defend Duluth-Edison Company.

A strong defense of the demands of the Duluth-Edison Company in its contention with the city council, was made in an editorial in the Duluth *News-Tribune* January 8. The company and council have been unable to agree on a rate for street lighting, the difficulty resting largely on the difference between the company's own valuation of its property and the city's valuation of it. The editorial states that in the beginning Duluth, ambitious beyond its development for electric service, offered inducement for capital in this field which brought in several lighting companies, which since have failed.

The Duluth-Edison Company, the editorial states, is the final composite of these electric lighting projects, and the fact of its survival shows it did better than the city. By reorganizing, it was able to eliminate a lot of business failure, and, meantime, it has not been accused of graft. The writer says: "It is a profitable concern now because it had confidence in Duluth, and because it saw this time ahead, which has now come, when it could pay dividends." The editorial concludes with this blighting sarcasm: "The city can back it (the Duluth-Edison Company) to the wall if it will. But has it turned Mexican, or has it turned frenzied finance?"

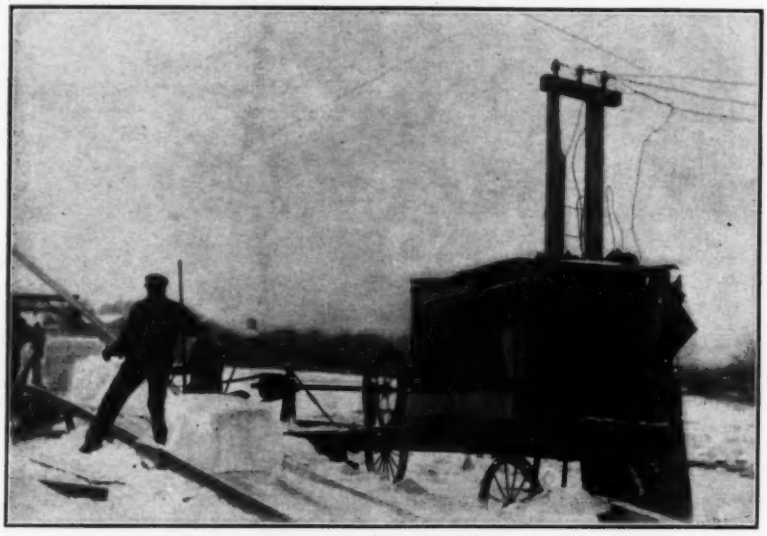
A special election has been called by the council for January 19 to decide whether to appropriate $85,000 for a municipal plant or enter into a contract with the company.

New Street-Lighting Contract for Stockton.

The city of Stockton, Cal., has accepted the bid of the Western States Gas & Electric Company for street and boulevard lighting for a term of five years, from December 15. The contract covers the present street-lighting system and certain additional lighting.

Electric Motor for Marketing Ice.

As the season for cutting ice upon the northern lakes has arrived, the application of electric motors to facilitate this work will be of interest. The accompanying illustration shows an arrangement used last year by the George A. Hormel Company, of Austin, Minn. A three-phase, 220-volt induction motor was used to elevate the ice from the water. This motor was located about 1,200 feet from the panelboard, and had a capacity of 20 horsepower, but was larger than was necessary, and was used because it was the only one available. A large motor, having a capacity of 25 horsepower, was used to hoist the ice into the different ice houses from the ground level.



Motor in Service in Ice Fields.

Central Stations Taking Advantage of Slump in Coal Market.

Electric light and power plants, particularly those throughout the Central West, have lately realized enormous saving in fuel bills by reason of an unusual condition of the coal market. From January to April is the contracting period for fuel supply, and public service companies are giving more than ordinary attention to the question of policy in this matter. An efficiency expert of the American Gas & Electric Company, New York, which under separate corporate names operates a number of plants in Western Pennsylvania, Ohio and Indiana, has been making the rounds of the coal-producing centers of several states, to size up the situation. Similar interest is being taken by other electrical power companies.

The almost universal use of the automatic stoker gives them the advantage of the cheapest sizes of coal, namely, screenings. During the latter half of 1914 this class of fuel reached the lowest point known for years in the Central West. Fuel that ordinarily costs from 40 to 60 cents per ton was down frequently to half those figures on the open market, and at times sold as low as 12.5 cents per ton. With the coal-producer screenings are a by-product which results from making domestic lump. They are therefore subject to wide fluctuation, both in volume of output and in price. If there is a strong demand upon the mines for lump, screenings accumulate rapidly and the price is downward. Ordinarily when the domestic market is dull, screenings become scarcer and higher.

Two factors enter into the lump market throughout the coal fields of the Central West. One is the requirements of a great territory in the Northwest, centering about Duluth and the twin cities of St. Paul and Minneapolis. This annually absorbs millions of tons for domestic use from the fields in question. Movement from the mines takes place during the lake navigation season, lasting usually from April until December. The other factor is that of winter fuel for the coal-producing states themselves and adjoining states. The lake movement, to which is added early in the fall the laying-in of retail coal dealers' stocks throughout the general selling territory, gives a strong impetus to lump production, and incidentally to the output of screenings. Even in a prosperous industrial year factory demand for screenings, coupled with that of public-service plants, is not equal to production. The natural thing is for prices to sag under these conditions and for big consumers to buy and store tonnage for future needs.

During the past few years, however, including part of 1914, coal producers were able, in large measure, to circumvent this form of economy on the part of screenings buyers. This was done through track storage. The railroads, particularly in Ohio, acting under permission of the State Utilities Commission, allowed screenings to be loaded on cars and held indefinitely on sidings in the vicinity of the mines and at assembling yards, without being subject to demurrage. In the Hocking Valley coal fields alone as much as 200,000 tons have accumulated in this way at times during the heavy lump producing season. By this means the screenings market was not glutted and prices were maintained. When production slowed down this surplus would be fed gradually into the market.

Some months ago the Interstate Com-

merce Commission ruled against this practice, with the result that screenings had to be disposed of when produced. This ruling also released to the market a surplus that was already in track storage. As a result there was a big slump in price. Another element that helped to force and keep prices down was the large percentage of idleness among factory consumers. Thus public-service plants for a while had things pretty much their own way. Most of them stored practically to the limit of their bin capacity. Those which happened not to be under contract to coal producers saved thousands of dollars on the open market on current needs.

Usually public service plants contract for the year for their fuel supply, but place the minimum tonnage below actual requirements so that they may take the benefit of low prices on the open market from time to time. This is always more or less of a gamble. It has happened on occasions that they have had to pay twice the contract price for extra tonnage not covered by contract. Sometimes the screenings price has taken such a jump that plants have bought mine run and crushed it themselves to make the coal suitable for their stokers.

One of the peculiar conditions this season was that many contracts were at the tag end, and storage at low prices could be indulged in liberally, as new contracts need not be entered into at once. It has been easy to fill the gaps between yearly contracts with short-time contracts at bargain figures. Usually a plant makes it a rule to keep from 60 to 90 days' fuel supply on hand, as insurance against miners' strikes and transportation hindrances.

The question now is, what is going to be the future of the screenings market? If January and February should be open weather, lump production would be light and the by-product of screenings scarce. The situation would be further aggravated should an industrial revival develop, bringing idle factories that are equipped with automatic stokers into the market for tonnage. Cold weather and a continuance of the present dullness in general manufacturing would give a surplus of tonnage until the lake season started again. Public service men are trying to anticipate the situation. In view of what they have been enjoying in the way of low prices, there is much hesitancy shown about renewing contracts at old figures.

Salem Company Secures 5,000-Horsepower Contract.

The Salem (Mass.) Electric Lighting Company has recently entered into a contract with the Naumkeag Mills for electric service aggregating 5,000 horsepower to be used in the cotton mills which are being completed.

Stockholders Organize to Fight Rate Reduction.

As a result of the agitation on the part of the City Council of Cincinnati, O., to lower the electric rates of the Union Gas & Electric Company, a committee of stockholders of the company has been formed to aid the officials and employees of the utility in its fight to have the existing rates continued. The committee is composed of 33 citizens owning stock in the Union company and strenuous efforts are being made to enlist the co-operation of the 8,000 other stockholders.

This movement is unique in the annals of litigation of this character and if carried out in the proper spirit should insure an equitable adjustment of the controversy. It is seldom realized by courts and councils that public utility corporations, like other enterprises, are owned largely by the public, but this move on the part of the Cincinnati stockholders, if entered into without reservation, should serve to at least impress this fact upon the local council.

There is every indication that the square-deal policy will be carried out in the present case. The *Stockholders Herald*, a weekly bulletin issued by the committee in the interest of the company, says in a recent issue, "The City Council is to be applauded for the innovation of having an Advisory Committee of citizens representing various commercial organizations sit with the Committee on Light in the electric rate hearing. It is progressive and exhibits a genuine desire to publicly solve important questions. The business men on the Advisory Committee, who are giving valuable time and thought to the problem are likewise to be congratulated. Close study of the electric rate question will disclose the merit of the company's case."

As an indication that the activity of the stockholders is proving of value the bulletin says, "Stockholders of the Cincinnati Gas & Electric Company made an impressive showing at the electric rate hearing before Council Committee on Light December 23. No words were minced by stockholders in publicly denouncing those who are endeavoring to destroy the savings of thousands of Cincinnatians. Stockholders are requested not to abate their interest in the rate question and to continue their united efforts to procure justice for the company. The company is giving splendid electric service to the community and has proven there is no reasonable ground for reducing rates." Commenting on the attitude of the public at large on the controversy, the *Herald says*, "Not a single electricity consumer appeared before Council Committee on Light December 23 to complain about the quality of the service or the rates charged. The agitation against the Cincinnati Gas & Electric Company is entirely artificial and is carried on by selfish interests that are the real enemies to the commercial and industrial progress of the city.

Appliance Campaign in Denver Results in 6,000 Sales.

The Denver Gas & Electric Light Company, working in conjunction with the appliance department of the General Electric Company recently completed a comprehensive domestic appliance campaign that resulted in the placing of approximately 6,000 devices. In addition to the usual publicity and advertising the campaign was greatly stimulated by appealing to the pride and sporting instinct of the company's salesmen.

The city was divided into sections and two salesmen assigned to each section. Individual and team prizes were offered for the best records and much friendly rivalry was exhibited. At the close of the special campaign a dinner was held by the sales department employees and the prizes awarded. At the same time two additional prizes, in the form of trips to the San Francisco convention of the National Electric Light Association, were offered in order to continue the excellent sales work.

Of the latter two prizes one is offered by C. N. Stannard, of the Denver Gas & Electric Light Company, and one by the General Electric Company.

The Memphis Jovian Christmas Tree.

Electrical christmas trees constitute a new field of activity which is attracting Jovian leagues throughout the country because no other organization is as well qualified to take care of the principal features of such a celebration and because it offers an opportunity for Jovians to do something definite at Christmas.

For the second year the Memphis Jovians presented such a Christmas celebration in the principal down town park. The tree was larger and far more beautiful and symmetrical than the first attempt, containing 1,000 more lights than the tree of 1913. The tree was lighted December 21 to permit the Christmas shoppers to participate in the celebration. The large crowds were entertained each evening with band concerts and moving pictures until Christmas eve, when a distribution was made by Santa Claus of 2,000 bags of Christmas cheer to white children. The Park was turned over to negro societies on Christmas night and the Jovians gave those in charge 1,500 bags for distribution to negro children. The entire expense was borne by the Jovians who kept the tree lighted until the New Year.

Electric Sign Data

A Unique Chinese Sign.

An electric sign has recently been installed in Singapore, by a Chinese merchant that is unique in many respects. The sign is 14 feet long by 2 feet 8 inches wide and 1 foot deep, and is to be fixed from the roof of a very lofty store. The local regulations prohibit the installation of a sign which projects more than three feet, and it was therefore necessary to arrange the advertising matter on the sign to read vertically. The Chinese characters lend themselves to this style of design, and the top three characters, which are visible day and night, represent the name of the store. This lettering changes in color, red, yellow, and green in succession, when illuminated at night time, with a complete blanking-out in between the different colors.

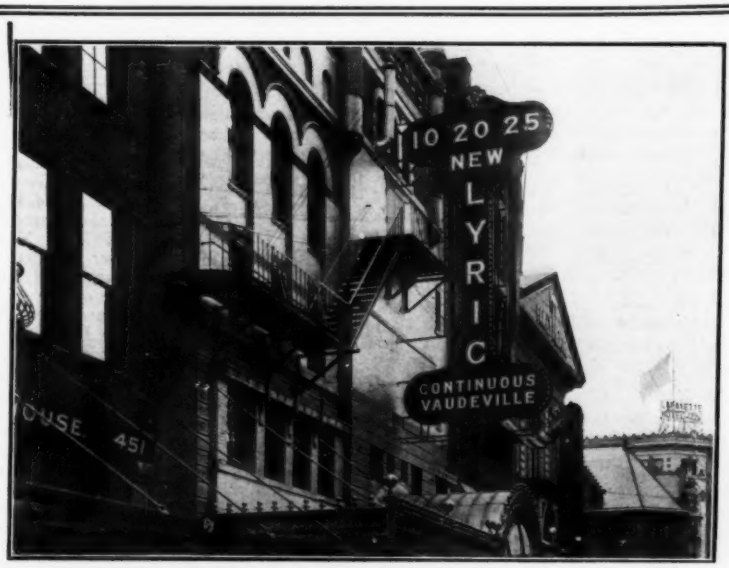
Each of the remaining three panels advertise some article manufactured by the store, and they figure on the sign in rotation in the same color as the name of the firm appears, so that with each change of color in the name there is a change of advertisement on the sign itself.

These lower panels appear absolutely blank in the day time. The panels are surrounded by a wavy beaded border arranged on the chasing flasher basis—two sections of twelve beads, that is, two lengths of approximately 18 inches are blanked out mechanically in succession all round the border.

In order to obtain the results described, about 30 distinct lamp circuits had to be wired, and the number of lamps employed is about 150. These have been varnished, in order that they will satisfactorily withstand the weather conditions of the tropical city.

The flasher is of the motor-driven pattern and controls the main panel circuits and the border. The sign is double-sided, with similar panels on each side. It is finished black stove enamel outside and white inside.

We present elsewhere on this page data and an illustration respecting a sign termed "Oplex Sign", manufactured by the Flexlume Sign Company, Buffalo, N. Y. This sign is made up of relief letters of opal glass set in a metal frame. Illumination is furnished by either 25 or 40-watt lamps, there being usually one lamp per letter. The manufacturers of these signs lay particular stress on the appearance of the signs during the day. The size of letters range from four inches to 15 inches and the background of the signs can be finished as desired by the purchaser. These signs also lend themselves to the usual flashing and artistic effects of bulb signs.



Theater sign in Buffalo furnished by the Flexlume Sign Company, Buffalo, N. Y. The lettering is of opal glass and metal background is of black finish.

The wording "Lyric" is in 24-inch letters, the figures "10, 20, 25" in 18-inch letters, the word "new" in 15-inch letters and the wording, "continuous vaudeville," in 12-inch letters. The numbers "10, 20, 25" flash on successively, the other wording burning continuously.

Around the edge of the sign is a border of colored lamps. By means of an appropriate flasher, the border gives the appearance of a rapidly moving band of colored light going from the bottom to the top of the sign and terminating in a spectacular detail at the top.

A clever application of the concentrated-filament Mazda lamp is suggested in a recent issue of *The Business Builder*. Throughout the country, a large number of water tanks mounted on the roofs of factories, office buildings, etc., bear the names of the companies owning them, or other advertising matter. By illuminating these signs at night their advertising value is greatly increased, but on account of the construction work and wiring, it would be an expensive matter to illuminate signs of this nature by lamps and reflectors. The effect is now accomplished economically by directing a beam of light against the sign from some nearby convenient location. The concentrated-filament, or stereopticon Mazda lamp in a parabolic reflector produces an incandescent searchlight beam which is very effective for this purpose and is coming into wide use.

Electrical Construction

CONCENTRIC WIRING DISCUSSED AGAIN AT NEW YORK.

The Special Committee of Electrical Interests Presents a Report Relating to a Conference with the Sub-Committee on Concentric Wiring Appointed by the National Fire Protection Association to a General Meeting of Electrical Manufacturers.

A meeting of the General Committee of Electrical Interests which was organized at the Biltmore Hotel on December 22, 1914, to consider the question of the introduction of a system of concentric wiring, was held at the Biltmore Hotel, New York City, on Tuesday, January 12. This meeting was called to listen to the report made by a Special Committee of the Electrical Interests which was appointed to confer with a Sub-Committee on Concentric Wiring appointed by F. E. Cabot, chairman of the Electrical Committee of the National Fire Protection Association. The events incident to the meeting of December 22 and the appointment of the several committees were reported fully in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of December 26, 1914.

Mr. Charles L. Eidlitz, chairman of the general committee, presided. George H. Duffield, secretary of the National Electrical Contractors' Association, acted as secretary of the meeting. The various lines of manufactures were represented by subcommitteemen as follows:

Wire—W. A. Conover, Standard Underground Cable Company, Perth Amboy, N. J.; R. K. Sheppard, B. F. Goodrich Company, Akron, O.; George A. Cragin, American Steel and Wire Company, Worcester, Mass.

Conduit—C. E. Corrigan, National Metal Molding Company, Pittsburgh; L. J. Campbell, Western Conduit Company, Youngstown, O.

Fittings—H. B. Crouse, Crouse-Hinds Company, Syracuse, N. Y.; W. T. Pringle, Pringle Electric Manufacturing Company, Philadelphia, Pa.; A. W. Berresford was represented by Mr. Stevens.

Porcelain—Herbert Sinclair, Star Porcelain Company, Trenton, N. J.; J. E. Way, R. Thomas Sons Company, New York City.

Boxes—R. B. Corey, Pratt Chuck Company, New York City.

Sockets—W. C. Bryant, Bryant Electric Company, Bridgeport, Conn., was represented by Mr. Goodrich.

Fuses—L. W. Downs, D. & W. Fuse Company, Providence, R. I.

Jobbers—Frank S. Price, Pettingell-Andrews Company, Boston, Mass.; E. W. Rockafellow, Western Electric Company, New York City; W. W. Low, Electric Appliance Company, Chicago.

Electrical Contractors—John Livingstone, J. Livingstone Company, New York City. Ernest Freeman and John R. Galloway were represented by Mr. Duffield.

Electrical Engineers—Gano S. Dunn, J. G. White & Company, New York City.

Fixtures—Louis McCarthy, Macallen Company, Boston, Mass.; R. B. Benjamin, Benjamin Electric Manufacturing Company, Chicago.

Special Sub-committee, to confer with Underwriters' representatives—H. B. Crouse, C. E. Corrigan, R. K. Sheppard.

The report of the Special Committee was presented by R. K. Sheppard. Preliminary to the reading of the full report two letters from R. S. Hale, of the Edison Electric Illuminating Company of Boston, chairman of the Committee on Wiring of Existing Buildings of the National Electric Light Association, were presented. These letters indicate the reason why the central-station industry is definitely interested in the development of a less expensive system of interior wiring. The first letter, dated January 4, was as follows:

"In reference to the question of cheaper wiring, I have asked some of the central stations to make estimates. Most of them hesitate a great deal to say anything, so that I have only got three definite figures. From Cleveland I have received an estimate that they can get 15,000 houses with the inexpensive wiring scheme, that they could not get under present methods. They are now wiring up only about 2,000 houses a year.

"In Baltimore they estimate 5,000 or 6,000 houses a year against only 1,500 a year that they are now getting, and they estimate that outside of Baltimore, but in the adjacent cities and towns, there are 125,000 houses on the lighting company's lines that they could get with the new system, but will not get with the present costs.

"In Boston our sales department estimates that it will get 5,000 houses a year against only about 1,500 houses a year that it is now getting.

"I shall hope to see you in Boston before long, and should be very glad to keep in touch with you, because I want you and the other manufacturers to appreciate that we want to look at all sides of this question, and that while we want this business we are not in any way tied up to any particular manufacturer merely because he happened to have a man on the committee."

Another letter from Mr. Hale, dated January 7, made the following report respecting conditions in New York City:

"One-family dwellings, 150,723; supplied with electricity, less than 10 per cent. Two-family dwellings, 75,195; supplied with electricity, about five per cent. Tenement houses, 100,504; supplied with electricity, less than 10 per cent."

Mr. Sheppard then read the full report as follows:

"Your special committee of five, appointed by George A. Craigin, chairman of the General Meeting of the Electrical Interests held at the Hotel Biltmore, New York City, Tuesday, December 22, 1914, obtained a conference on January 1, 1915, with the Sub-Committee on Concentric Wiring which was appointed by Chairman F. E. Cabot, of the Electrical Committee of the National Fire Protection Association, with instructions from Chairman Cabot 'to prepare a set of rules covering the Bare Concentric System.'

"In introducing the subject for discussion Chairman W. H. Blood, Jr., of the Sub-Committee on Concentric Wiring, read aloud, for the benefit of the conference, a preamble which was prepared as the first part of a proposed report to the Electrical Committee of the National Fire Protection Association. Mr. Blood stated that the preamble was to be accompanied by a set of rules under which installations of concentric wiring might be permitted, but that his committee did not intend that the said rules should become a part of the National Electrical Code until, and unless, trial installations of the proposed concentric system should justify subsequent inclusion of those rules within the Code.

"The preamble thus read by Chairman Blood proposed that after adoption of the preamble and rules by the National Fire Protection Association the said preamble and rules should be printed and available to any interested party upon proper application being made to the secretary of the Electrical Committee of the National Fire Protection Association, or on

similar application to the Underwriters' Laboratories, Inc. The preamble set forth that the intent of that document and the accompanying rules was to provide the necessary authority under which inspection districts, or departments, which desired to experiment with the system, should have the desired endorsement of the National Fire Protection Association for the construction of trial installations alone on a commercial scale.

"The said preamble and rules had not received the approval of the Sub-Committee on Concentric Wiring in the form of a definite vote thereon. But your special committee was given to understand that the preamble with rules was submitted to your special committee as representing the latest and most completely formed opinions of the entire membership of the Sub-Committee on Concentric Wiring. No adverse propositions, or contrary statements, were offered by any of the members of that committee at the beginning of the conference.

"In the opinion of your committee the proposed preamble with rules, if it were adopted by the National Fire Protection Association, would, whether so intended or not, permit such free use of the authority to place in service trial installations that the system would promptly find commercial usage beyond the possibility of control by the inspection departments of the National Board of Fire Underwriters, or inspection departments of other governing bodies, either national, state or municipal.

"The chairman of the Sub-Committee on Concentric Wiring explained that the desired trial on a commercial scale involved a thorough test of the principles of all-grounded return circuits. He plead for an early and extended trial of concentric wiring in branch circuits for the reason that the success of such a trial would establish fundamental reasons for the ultimate adoption of the principle of an all-grounded unbroken return circuit in building construction. Advocating the principle of all-grounded return circuits he claimed for it a larger degree of safety to persons and more perfect protection of buildings from fire than can be assured by supposedly all-insulated circuits. He cited the history of the progress during the past 12 years of the Code requirements for grounding of various kinds. He stated that step by step, from the early requirements of absolute complete insulation of all apparatus, wires, fixtures, etc., through the first grudging permission to ground certain portions of the system, the National Electrical Code has gradually been brought to the place at which grounding of the system is mandatory up to the point at which distribution within a structure begins. He considered as anomalous to one another those mandatory provisions of the Code as to grounding and the additional Code requirements that the distribution systems within structures shall be all-insulated.

"The urgent desire of the electric-lighting interests for a permitted system of house wiring, which would enable electric light companies to obtain the patronage of small house holders, was strongly urged as a prime reason for seeking quickly the results of actual service obtained from trial installations of concentric wiring on a commercial scale.

"Under the specific instructions of the meeting of the Electrical Interests on December 22, at the Biltmore Hotel, your special committee sought for a reasonable modification of the proposed preamble which would effectively prohibit commercial installations of the concentric wiring system until the American electrical industry at large has been given ample opportunity to develop and present for effective trial such devices as American inventive genius may suggest to the end that the electrical industry may have available for common use some form of wiring which will embody—

"(1) Ample protection of persons against injury by the electric current.
"(2) Thorough protection against fire.
"(3) Low cost.
"(4) Ease of installation.
"(5) Good appearance.

"After thorough presentation by your committee of its case, and abundant discussion thereof, the Sub-Committee on Concentric Wiring offered to modify the proposed preamble and to submit the modified preamble to the members of the Sub-Committee on Concentric Wiring for letter ballot. The wording of the revised preamble is—

"Grounded Concentric Wiring Systems.

"'The committee reports progress and desires to be continued for further investigation of the subject. As a matter of information at the present time, however, the following statements and a set of suggested requirements, illustrating the rules for one possible form of system, are presented:

"'The committee does not at this time recommend these or any rules for concentric wiring for inclusion in the Nationl Electrical Code, but recommends that this report in full be filed with the Secretary of the Electrical Committee of the National Fire Protection Association and with Underwriters' Laboratories, Inc., and that by them copies of it may be furnished upon request to applicants therefor.

"'The interest in a system of grounded concentric wiring has arisen chiefly from two considerations:

"'(1) A desire for a system of wiring possessing advantages of low cost, ease of installation and good appearance.

"'(2) A desire to protect persons against injury by the use of a grounded system having no ungrounded exposed current-carrying parts.

"'It is the intent of the following suggested and illustrative rules to prescribe, only for possible experimental and development purposes, the general conditions for a system of grounded concentric wiring. These illustrative rules are therefore only a partial outline of possible future requirements and are subject to revision, modification and extension, resulting from further information and experience when such is obtained. A system which fulfills the conditions outlined below and no more will not necessarily be acceptable and suggestions for the further development of similar systems and the requirements applying to them are invited. All appliances and systems should be submitted to Underwriters' Laboratories, Inc., for examination and report.'

"With this preamble will be submitted for letter ballot by the members of the Sub-Committee on Concentric Wiring a set of illustrative rules as mentioned and described in the preamble. Chairman W. H. Blood, Jr., has been requested by your committee to provide us with a complete document giving both the preamble and the illustrative rules. Also he has been requested to inform us promptly of the results of the letter ballot cast by the members of his committee.

"Chairman W. H. Blood, Jr., offered, on behalf of his committee, to receive and thoroughly consider all future criticisms or suggestions which you, the General Committee of Electrical Interests, may desire to present either through your present special committee or through any other channel."

The gentlemen present at the conference January 1, 1915, were: W. H. Blood, Jr., Chairman; H. S. Lawlor, H. R. Sargent, J. C. Forsythe, Washington Devereaux, A. M. Paddon, J. R. Strong, Dana Pierce. Guests of the Sub-Committee on Concentric Wiring —R. S. Hale, Wm. H. Onken, Jr. Special Committee of the Electrical Interests—C. E. Corrigan, H. B. Crouse, R. K. Sheppard.

"Frank S. Price and Ernest Freeman both were prevented by business engagements from joining in the conference January 1. But the former of those gentlemen participated with R. K. Sheppard in the preliminary conference with W. H. Blood, Jr., chairman, at which the purpose of the special committee was explained to Mr. Blood and the conference with the Sub-Committee on Concentric Wiring arranged for January 1. Ernest Freeman has expressed a most cordial desire to work with the special committee and also with the general committee and particularly regretted his inability to attend the January 1 conference. He endeavored to provide a substitute through a special appointment by John R. Galloway, president of the National Electrical Contractors' Association. His desire to be thus represented unfortunately failed through circumstances beyond the control of either Messrs. Freeman or Galloway.

"The work of your special committee would be incomplete at this point. Therefore we have formulated and herewith present for your consideration specific suggestions looking to the ultimate wisest solution of the entire problem now before us. Foremost and most immediately important is the suggestion which was orally offered to your committee by H. R. Sargent, member of the Sub-Committee on Concentric Wiring, representing thereon the manufacturer. He suggested that, for the purpose of studying rapidly and thoroughly both our present practice of all-insulated circuits and coincidently the principle of grounded-return circuits and endeavoring to produce something better, the electrical manufacturers appoint a representative committee of business and technical experts, possibly including in its personnel representatives of research and development departments of manufacturing and other enterprises, including the Underwriters' Laboratories, Inc., and the National Electric Light Association. Your committee would suggest to that committee that the industry should entrust:

"(1) The determination of the relative efficiencies of the two systems. (a) —As to safety to persons; (b)—As to protection against fire; (c)—As to the possible provision of methods of wiring at low cost, combined with the ease of installation and sufficiently attractive appearance to obtain popular approval.

"(2") To present to the entire industry the results of its investigations in the form of concrete recommendations, including standard systems, standard devices and standard appliances.

"Mr. Sargent expressly requested the chairman of your special committee to inform you that to such a representative body of experts he, on behalf of the General Electric Company, tenders the fullest co-operation in which he means to include the use by that company of the knowledge already acquired by the General Electric Company in its study of concentric wiring.

"Likewise R. S. Hale, chairman of the Committee on Wiring of Existing Buildings of the National Electric Light Association, requested the chairman of your special committee to offer to such a representative body heartiest co-operation by his committee and by the National Electric Light Association interests with which he is connected.

"The second suggestion of your Special Committee is that the electrical manufacturers be requested to appoint a publicity committee, said publicity committee to be instructed to search out, obtain, and publish in the trade journals and through other suitable mediums, as many facts as can be discovered having either an interesting or an important bearing on the subjects: 'Concentric Wiring'; 'All-Insulated Return Circuits for Interior Wiring of Structures in America'; 'All-Grounded Return Circuits for Interior Wiring of Structures in America'; that to said publicity committee the proposed Representative Committee of Business and Technical Experts be directed by the electrical manufacturers to deliver frequently for publication in the trade journals and through other suitable mediums full accounts of the progress of the investigations, stating results obtained and as rapidly as formulated the recommendations which ultimately will be assembled into the final, complete report of the Representative Committee of Business and Technical Experts to the Electrical Manufacturers.

"The third specific suggestion of your special committee pertains to organized co-operation throughout the electrical industry to be arranged only in complete compliance with the laws of the land, both Federal and State:

"'The central-station interests have their National Electric Light Association.'

"'The fire insurance companies of the country have their National Board of Fire Underwriters, and their National Fire Protection Association.'

"'We understand that the life and accident insurance companies either are, or soon will be, similarly organized.'

"'The electrical jobbers have their National Electrical Jobbers' Association.'

"'The electrical contractors have their National Electrical Contractors' Association.'

"'Apparently the manufacturers' is the one and only branch of the electrical industry not now equipped with the machinery for concerted action.'

"With this preliminary statement your special committee suggests to you:

"'(1)—The wisdom of immediate consideration of this problem by the manufacturers here represented.

"'Assuming that an association of manufacturers can be satisfactorily maintained under Federal and State laws, a direct and prompt return from a proper organization, into a working body, of the many different sections of the manufacturing branch of the electrical industry was most happily described to your committee on Thursday, January 7th, by W. H. Merrill, manager of the Underwriters' Laboratory, Incorporated, during an interview in his Chicago office. More than 1,000 factories included in fully 100 different industries in the United States are working with and are served by the Laboratories. Of those one hundred odd industries several already are enjoying the abundant benefits of the different industry conferences organized by the Laboratories. The rubber-insulated wire manufacturers participate therein through the Rubber-Covered-Wire Industry Conference. To those industry conferences the Laboratories present for consideration all matters which have, or may have, directly or indirectly, either favorable or adverse effects on the portion of the industry involved. Mr. Merrill clearly stated last Thursday that manufacturers so equipped with their proper industry conference are assured of positive control against hasty or ill advised action by the Underwriters' Laboratories, Inc., or by other authorities who depend upon the laboratories for investigation of the problems which confront them from time to time. Speaking for the wire manufacturers, the chairman of your special committee gladly testifies here that Mr. Merrill's assurance is not in any wise an overstatement of the fact.

"'As a terse embodiment of the co-operative spirit with which the Underwriters' Laboratories, Inc., will welcome an organization of the manufacturers, we here present a resolution which has Mr. Merrill's endorsement:

"'WHEREAS, Conference committees made up of representative committees of manufacturers and representative committees of Underwriters' Laboratories, have been appointed from time to time to serve the interests of a number of sections of the electrical industry; and

"'WHEREAS, The practical results obtained through the operation of these conferences have been of decided benefit to the sections served;

"'WHEREAS, BE IT RESOLVED, That a committee be empowered to take steps necessary to secure the appointment of a conference committee representing the industry as a whole, which may deal with those broader questions affecting manufacturers in more than a single line.'

"This report of your special committee is hereby tendered to you with the request that the committee shall be now either discharged or continued with specific duties, as you, the members of the General Committee, may decide.

"Ernest Freeman,
"Frank S. Price,
"C. E. Corrigan,
"H. B. Crouse,
"R. K. Sheppard."

The report of the Special Committee was approved and adopted by the General Committee. H. R. Sargent, of the General Electric Company, addressed the meeting, describing the concentric system of wiring and the fittings which would be suitable for use with this system. Mr. Sargent answered a number of inquiries and a general discussion was participated in by H. B. Crouse, C. E. Corrigan, C. L. Eidlitz, Oscar Hoppe, George A. Cragin, L. J. Campbell, W. T. Pringle, John Livingstone, Louis McCarthy, C. E. Skinner and W. W. Low. A vote of thanks was extended to Mr. Sargent and to the Special Committee of which Mr. Sheppard is chairman, and both the General Committee and the Special Committee were continued. The General Committee adjourned to meet in New York, on February 9.

Electrical Manufacturers Organize.

Special Telegram.

New York, January 13.—Some 50 electrical manufacturers met at the Hotel Biltmore on Tuesday afternoon to consider plans for the organizing of a National Association of Electrical Manufacturers. R. K. Sheppard, of the B. F. Goodrich Company, Akron, Ohio, was elected chairman, and H. R. Sargent, of the General Electric Company, Schenectady, N. Y., was elected secretary. After considerable discussion, and consideration of the scope of similar electrical associations which was participated in by A. W. Burchard, General Electric Company; H. B. Crouse, Crouse-Hinds Company; L. A. Osborn, Westinghouse Electric & Manufacturing Company; W. T. Pringle, Pringle Electric Manufacturing Company; C. L. Eidlitz, Metropolitan Electric Manufacturing Company; W. C. Bryant, Bryant Electric Company; L. J. Campbell, Western Conduit Company, the chair was authorized to appoint a committee of nine on organization, to report at a meeting which will be held in New York on February 9. The chair was also authorized to appoint a committee of five members to suggest names for a committee of business and technical experts to consider the whole question of concentric wiring.

Electrical Accidents in Mines.

According to the inspector of mines, during the year 1912 there occurred in the coal mines of Great Britain 15 electrical accidents resulting in 16 deaths, while 50 non-fatal accidents resulted in injuries to 51 persons, but of these only 43 workmen were disabled for more than seven days. Altogether there were 1,220 fatal accidents which caused 1,753 deaths, so that the deaths due to electrical accidents are a little over 0.9 per cent. There were 177,189 persons injured, so that the proportion of non-fatal electrical accidents is still less, being only about 0.024 per cent. Considering the great development of electricity in mines it certainly cannot be said that it has increased the danger to workmen employed.

Municipal Electrical Rules Made More Stringent in Louisville.

By an understanding reached by the city building inspector, the city electrical inspector and a representative of the Louisville Branch of the National Electrical Contractors' Association, regulations by which danger from electric installations in Louisville, Ky., will be greatly decreased are soon to be promulgated. Principally the order will provide that after the first of February nothing, but metal-clad wiring construction will be approved inside the fire limits of the city. In addition the same provisions will apply to factory buildings anywhere in the city, to apartment and to tenement houses of more than three stories in height. Heretofore any of the practices not prohibited by the National Electrical Code have been in use.

Still another regulation, similarly agreed upon, provides that on and after the first of July wooden moldings for incasing electric-light or other electric wires will be under the ban everywhere in the city.

The order, which is to go out from the office of City Building Inspector W. J. O'Sullivan shortly, resulted from the action of Herbert Ottenheimer, president of the Home Electric Company and president of the Louisville Branch of the National Electrical Contractors' Association, who took the matter up with Mr. O'Sullivan and the other city authorities. It has received the approval of the Board of Public Safety.

Code to Be Adopted in Ohio.

The electrical section of the Ohio building code is now ready to submit to the State Legislature. It will be a separate installment from other sections of the code, some of which have already been placed in force. Fred H. Elliott, of Columbus, the chairman of the commission which has had the work in charge, states that the electrical section will simply be a copy of the National Electrical Code, except that the language is changed where necessary. Heretofore Ohio has had no building code governing electrical installation.

Electrical Licenses Opposed in Cincinnati.

Opposition to the proposed Cincinnati ordinance providing regulations for electrical contractors and electrical work, with license provisions which have been declared obnoxious, has been organized by a number of business concerns affected, principally the owners of large buildings, but including also a number of industrial concerns. A public hearing which is to be held by the City Council on the ordinance will be attended by representatives of the interests involved, and an energetic effort will be made to defeat the proposed measure.

Program of Meeting of Wisconsin Contractors.

The Electrical Contractors' Association of Wisconsin will meet at the Hotel Wisconsin, Milwaukee, on January 18, 19 and 20. Business sessions will be held on Monday afternoon and Wednesday morning. The sessions on Tuesday morning and afternoon will be open, and the following addresses will be made: "The Jobber in the Field," by H. P. Andrae; "The Contractor in the Field," by D. Elmer Roberts; "Illumination From Concealed Sources," by L. G. Morgan; "The Incandescent-Lamp Developments of 1914," by Earl A. Anderson; "Wireless Telegraphy," by C. Lloyd Chafee.

At 6:30 p. m. on Tuesday, there will be an informal dinner, at which an address will be made by William T. Goffe.

At the meeting on Wednesday morning there will be an address by C. Netzhammer, on the subject "Where to Put and Where to Find It." At the afternoon session, C. R. Kreider will speak on "Estimating."

Missouri Contractors Will Discuss License Law.

Missouri electrical contractors are determined to effect the passage of a license law to apply to individuals, firms and corporations who contract for and make electrical installations. The matter will probably be the chief subject of discussion at the annual meeting of the state organization of electrical contractors, which will take place January 23 in Kansas City, Mo. A move was started one year ago to bring about legislation requiring the examination of persons desiring to engage in the business. The Legislature failed to consider the bill presented to it, and will be petitioned to do so this year. The contractors will also consider the proposed workingmen's compesation law which is now receiving the attention of the Missouri assembly.

Burglar Alarm for Freight Cars.

A system of electric bells has been installed by the Superior (Wis.) Milling Company as a preventive against danger from prowlers who break into cars in the company's yards. The first trial has resulted in a number of arrests, and officials of the company speak highly of it.

The device consists in wiring inside and outside with small copper wires all box cars as soon as they are switched into the yards. Special wires are placed on side doors, and all are connected with a large electric bell in the main office. An attempt to enter a box car automatically releases the alarm, and watchmen immediately and quietly go to the car and lock the intruder in until the police have been called. Several vagrants have been brought into the municipal court within the last few weeks as a result of the installation of the system, and valuable property has been saved from the danger of being stolen or ignited.

Bond Requirement Proposed in Michigan.

The Michigan Builders' and Traders' Exchange has recommended a law which would require electrical contractors to give a bond to undertake contracts exceeding $2,000.

Among the Contractors.

The Beaver Engineering Company, Newark, N. J., has been awarded a contract by the Common Council for electrical work in the new addition to the City Hospital.

The Beattie Electrical Company, of Cincinnati, O., has been awarded the wiring contract for the new chemistry building of the University of Cincinnati by Consulting Engineer Walter G. Franz, who has charge of the mechanical end of the work.

The electrical sales and construction business of George F. Wacker has been incorporated at Plymouth, Wis. The organization is now known as the Geo. F. Wacker Electrical Company and has moved to larger quarters in the Volquarts Building. Only the most modern and approved equipment is handled by the Wacker company.

The Beck Electrical Construction Company, of Minneapolis, Minn., is reconstructing the electrical equipment of the present plant of the Minneapolis Artificial Ice Company and equipping a recent addition with 225 horsepower in motors and electric lighting, which will involve the placing of several hundred switches, circuit-breakers and meters. The switchboards, panels and conduits of the old plant will all be rearranged and put in up-to-date condition.

The Central Electrical Construction Company, 242 West Central Avenue, Toledo, O., is planning material extensions to its selling and wiring departments. This company is not yet quite two years old, but is doing a rapidly increasing business in all its lines; a large amount of the electrical contracting and repair work in Toledo is now handled oy the company, of which William Hunter is the enterprising head. A new department handling automobile accessories and supplies is to be added soon.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, President, 59 Deerfield Avenue, Hartford, Conn.
H. S. WYNKOOP, Vice-President, Municipal Building, New York, N. Y.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, City Hall Annex, Boston, Mass.

Executive Committee
EUGENE N. DAVIS, Chairman, Brookline, Mass.

SECTION REPRESENTATIVES:
C. H. Fletcher, H. Burnes, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
C. A. Hannan, O. E. Smith, New York City.
C. W. Mitchell, John W. Carrell, California.

MEMBERS AT LARGE:
George L. Collison, Frank R. Daniel, James H. Fenton, F. G. Hartwell, J. E. Latta, James B. McCarthy, Thomas D. MacColl, A. A. Moffitt, R. P. Strong

"LET THE CODE DECIDE."

Secretary's Message.

The Secretary desires to state that Mr. Wilber C. Field, 50 Hollywood Street, Springfield, Mass.; Mr. T. A. Rahilly, 428 Eighth Street, Brooklyn, N. Y.; Mr. William J. Rickerby, 442 Gates Avenue, Brooklyn, N. Y., have become members of the Association.

The headquarters of the Association during the March convention, the exact date of which will be announced shortly, will be at the Hotel Martinique, Broadway and Thirty-first Street, New York City.

President Day has appointed a Committee on Banquet consisting of Messrs. Wynkoop, Hannan, Cole, Knight and Braddell, and the members will presumably hear from them shortly.

The Secretary desires to call the attention of the Section secretaries to the provisions in the Articles of Association (of which they all received copies—if misplaced, see ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of November 1, 1913), relating to required Section activities during the month of January.

Mr. J. W. Cook, chief inspector of Vancouver and secretary of the British Columbia Section, left some time ago for service with the Canadian troops under General French.

The approaching meeting of the Electrical Committee of the National Fire Protection Association will be very important in many ways and it is hoped earnestly that as many as possible of our members will plan to be in New York for the full three days covering our convention as well as the Committee meetings.

A bulletin of the proposed changes will be sent each member as soon as received from the secretary of the Committee.

Pipe for Fixtures.

Question 284. Would it not be well to require pipe the equivalent of conduit in the making up of fixtures, instead of allowing the use of ordinary gas pipe as we now find?

Answer 1 (P). I do not at the moment see reasons for requiring conduit in place of gas pipe; still I think it desirable that the author of the question should state his grounds for advancing it, as a basis of discussion.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Answer 2 (M). For the convenience of the inspector such a requirement might be desirable as it would be easier then to determine if Rule 77*d* had been complied with.

Answer 3 (H). This suggestion strikes me as a thoroughly excellent one.

Answer 4 (F). Conduit is required by the Code as a protection to the wires contained in them. The gas pipe in a fixture is not used for this purpose and need not be of the same quality.

Answer 5 (B). This question appears to be for an opinion as to the advisability of fixture construction and not asking for the interpretation of a Code rule. It appears to me that any construction conforming with the National Code requirements should be accepted as satisfactory, even though in one's own mind a better construction appears to exist.

Answer 6 (U). It would hardly seem necessary to require special pipe for fixtures.

Answer 7 (S). I do not see any real reason for requiring pipe the equivalent of conduit. We have had no trouble in this line.

Answer 8 (V). In my opinion it would do a great deal in straightening out certain things,—bringing the business apart from other lines that have in the past caused trouble.

Answer 9 (I). I have canvassed the matter raised in this question pretty thoroughly with my associates in the Laboratories, and we are wondering whether there has been unfavorable field experience with gas pipe in fixtures which has prompted this question.

We fail to find in our files any criticisms of the use of gas pipe. It seems probable that the use of this material became general as a result of the former very prevalent use of combination fixtures.

If conduit were substituted would it not be necessary to use pipes smaller than now permitted by the Code, except in a few special instances?

This matter is one which interests us greatly and we shall be very glad to have the benefit of any information which comes to you from experience in the field.

Answer 10 (N). I think this whole matter of fixtures in the Code today is chaotic and needs thorough overhauling and revision. As to this one point, however, I see no special need so far as my experience goes. It comes up principally in cases where some lamp

is specially supported, the wireman claiming it a fixture and that he can use gas pipe, the inspector claiming it is mechanical protection with incidental supporting, and conduit must be used.

Answer 11 (Q). Yes, it would be especially when installed without insulating joints.

Answer 12 (R). Yes, I think this is a very excellent suggestion.

Answer 13 (O). It would certainly be well in some cases to require heavy pipe for fixtures, and unnecessary in many other cases. The whole matter of fixture requirements in the National Electrical Code *should be the subject of careful study and revision by a competent committee.*

Answer 14 (E). In my judgment Rule 77 amply covers the manufacture of fixtures. A study of the rule will show that several ways are suggested for wire ways. Under the rule either conduit or pipe properly prepared may be used. The rule has apparently given satisfaction in this territory and I do not recall any reason for the suggestion.

THE ELECTRICAL INSPECTOR, HIS WORK AND HIS STANDARD.[1]

By Thomas Henry Day.

His Work.

In the last analysis, the work of the electrical inspector, no matter what his business connection may be, is that of preventing fires from electrical causes. The public service companies are extremely anxious that defective electrical equipments be reduced to a minimum. To accomplish this end many public service corporations employ inspectors and refuse to connect their service to improperly equipped installations. Many municipalities, having the authority and dignity of the law of the commonwealth behind them, have organized inspection departments that the city's interests, and those of its people, may be safeguarded. The fire underwriters are also active with the same purpose in view, but, perhaps, all employing different methods. As the standard of electrical equipment has advanced, through the work of inventors, the standard of installation has also improved, until today the recognized standard, the National Electrical Code, represents the advancement made in the science of applied electricity.

The standard of inspection has also advanced until the inspector is now frequently referred to as being a "fire-prevention engineer." The interests which now employ electrical inspectors expect their employees to measure up to an engineering standard, that work shall not be incompletely and carelessly done; that intelligence shall be apparent in all that they engage; that courtesy and diplomacy shall replace abruptness and indifference; that ability shall be considered and political pull relegated to past days. In a word, I believe the inspectors of tomorrow, or of the near future, will be chosen for their fitness and we, who are inspectors, should prepare ourselves so that we may be considered as being, in reality, fire-prevention engineers.

Object of Electrical Inspection.

When inspecting electrical installations with the view to determining the fire hazard, the inspector can not render such service as belongs properly to an electrical engineer in designing, planning and determining the materials to be used and the methods to be followed to accomplish the desired ends. Consideration of initial expense, as well as operation and maintenance, efficiency, depreciation and continuity of service, are of importance. It *would* be proper for an inspector to examine plans and to offer such advice and to suggest methods which will result in reasonably safe conditions. Mr. Dana Pierce, of the Underwriters' Laboratories, says: "Electrical engineering is far too complicated a profession to be mastered fully by the fire-prevention engineer or by an inspector, but the general principles of safe electrical work can be mastered and applied without presuming to encroach on the work of either the consulting or the installing engineers." Mr. Ralph Sweetland, engineer of the New England Insurance Exchange, expresses himself upon the object of electrical inspection in the following manner: "At the outset there is one point which should be made clear, and that is, the fire-prevention engineer or inspector examines an installation of electric light, heat or power solely to ascertain whether it is safe from liability to cause fires or be dangerous to life. He has nothing to do, however, as to whether or not such an installation is suitable for the uses intended. While an installation may be entirely satisfactory from a fire or life point of view, it may not be at all suitable for the convenience of the owner or occupant. The fire-prevention engineer or inspector cannot pretend to do the electrical engineering necessary for even a moderate-sized installation, but should be capable of passing on plans and the execution of the work that property and life may be properly safeguarded."

How Fires by Electricity Are Caused.

We now understand the objects of electrical inspection and the relationship of the fire-prevention engineer or inspector to such electrical inspections. Leading to a consideration of the causes of fires from electricity, let us consider what should be in the mind of the fire-prevention engineer or inspector as he makes his examination of an electrical installation. He should consider that every system of electrical distribution, no matter what its *intended* purpose may be, *is* a system of heat distribution, and not light and power distribution as is the viewpoint of the electrician or his client, for whom he is making the installation.

It would be wise for him to consider that every electric current is indisputably known to heat, more or less, the entire circuit through which it flows—the wiring, the fittings, which may be of endlessly varying design and character, the lamps or motor, and anything or everything which may form parts of its circuit paths.

It would be well for him to remember that electric lighting merely arranges paths of current flow through a building, so that the heating shall not be sensible, if all is in good order, except at predetermined places, such as the filaments in an incandescent lamp, the units and elements of heating and cooking devices or arc-lamp carbons, where by design the heating property of the electric current is utilized. It is the heat which is of interest to the fire-preventing engineer or inspector and not the light, which is merely a by-product of the heat.

One more thing he should consider and that is that electricity sets fire to property because this system of electrical heat distribution intended to produce a high temperature solely at the lights and in the heating units, does by reason of derangements sometimes take effect at unintended places where heating is disastrous. He need only to make up his mind that the vaunted mysteries of electricity, to him, narrow down mainly to a question as to whether a wire or a fixture under inspection can, if it overheats, set fire to the risk. The whole question must be viewed by him as one of direct heat, and therefore, like other sources of direct heat, is most securely dealt with where it is possible to get safe mechanical conditions apart from, and in addition to, any electrical provision of insulation.

Mr. Albert Blauvelt, of the Western Factory Insurance Association, advocated such a condition of mind, for the inspector, as early as 1895. The National Electrical Code, which should be the guiding standard for all electrical inspectors, somewhat provides for future possibilities when it suggests: "In all electric work, conduc-

[1]A paper read before the Western New England Section.

tors, however well insulated, should always be treated as bare, to the end that under no conditions, existing or likely to exist, can a ground or short-circuit occur, and so that all leakage from conductor to conductor, or between conductor and ground, may be reduced to a minimum."

Fires may be caused by electricity by one or both of two general causes: (1) By overheating of conductors, switches or other devices, which may cause the insulation to ignite or the device to overheat and set fire to surrounding objects. It is, therefore, necessary rigidly to examine the protective devices so that the current and devices may be limited to their safe carrying capacity. These protective devices themselves may also heat, so that it is necessary to provide for their proper location. (2) By the forming of an arc. An arc is always accompanied by heat, and if it is of sufficient capacity may not only ignite combustible material, but may melt metals. Arcs may be formed between two wires of a circuit, between a wire and any grounded metal, or between a metal and another grounded metal, the former being in contact with a wire of a circuit. On this account, all wires are considered as bare, and are to be so supported that even bare they cannot come in contact with anything other than their designed supports.

The chief requisite for a safe installation is the use of approved material. By this I mean material that has been examined and is known to be suitable for the uses intended, with a reasonable margin for safety (In this direction we are being aided to a very large degree by the Underwriters' Laboratories, Incorporated. At these laboratories devices and materials are tested, the results of these tests, if favorable, being made known through the semi-annual lists of approved fittings); a design which will permit of easy inspection and repair, and the choice of type of installation which will afford the greatest protection to the wires, switches, cutouts and other devices.

Public Service Commissions

Conducted by William J. Norton

NEW JERSEY.

Annual Report. The Board of Public Utility Commissioners, in its annual report to the Governor and the Legislature, asks for an amendment to the act creating the Board and defining its powers, which will establish clearly an authoritative declaration of state policy and **legislative intent** in the matter of franchise **valuations** of public utility property. The Board recommends that the amendment should provide that the franchise of a public utility shall not be valued in excess of the amount the Board finds to be legitimately spent in procuring it. In connection with this recommendation the report says: "Such is the policy of the State as specifically declared in the public utility act with respect to capitalization of franchises."

This amendment is deemed necessary on account of the recent decision of the Court of Errors and Appeals in the 90-cent gas rate order. Discussing the court decision, the Board says: "So long as the decision of the court is in effect and the law is unchanged the action of the Board must conform to the decision. The Board does not understand that the decision of the court questions the right of the Legislature to declare a State policy different from that now held to be in effect."

In discussing the determination of value of utility property to be used as a basis for rate-making the reports says: "It is the opinion of the Board that this basis should not be merely the value of the company's physical property used in supplying service to the public. To hold this would require the elimination from consideration of expenditures legitimately incurred in developing the business of the utility to a state of efficiency commensurate with the requirements of the community in which it operates. The management of a utility which develops the utility's business in a thorough and efficient way; which seeks to obtain and is successful in getting and holding as its customers those who, except for the effort of the utility to make its service attractive would not take it, should not be penalized. Expenses reasonably incurred in this way, sometimes called 'going value,' sometimes 'development cost,' in the opinion of the Board should be considered in determining the base on which a return should be allowed. This is the rule uniformly applied by other commissions and the courts in rate proceedings. The utility furthermore should be allowed a return on expenses legitimately incurred in obtaining the franchise under which it operates."

NEW YORK.

The Empire Gas & Electric Company has been authorized to purchase, for not more than $19,000, the $15,000 par value outstanding capital stock of the Weedsport Electric Light Company. The order of the Commission provides, however, that after the purchase of the stock the Empire Gas & Electric Company must amortize it at the rate of $500 for 1915 and $1,000 for each succeeding year until it is carried on its books in 1920 as but $13,500.

The Associated Gas & Electric Company, which owned, before the Public Service Commission law became effective, a majority of the stock of the Norwich Gas & Electric Company, is now authorized to acquire $36,000 par value of the outstanding stock of the Norwich Company, and $33,400 new stock to be issued under an order of the Commission dated September 9, 1914.

The Wallkill Valley Electric Light & Power Company was authorized to issue $23,500 of its 25-year, six-per-cent, first-mortgage bonds dated January 1, 1915. Of this amount $15,000 par value of the new bonds are to be exchanged for a like amount of the present first-mortgage bonds of the company now outstanding; $4,000 is to be used to fund certain bills payable; and $4,075 is to be used to pay for the erection of a transmission line.

OHIO.

The Mahoning County Light Company applied for authority to issue securities for the purpose of acquiring the property of the Youngstown Heating Company, a company engaged in furnishing steam for heating purposes in the City of Youngstown, O., and for the further purpose of constructing an electric light and power plant and distribution system in that city. The application was opposed by the Youngstown and Sharon Street Railway Company. The objector is furnishing electric service for light and power purposes within the city and urged that the Commission refuse to permit the unnecessary duplication which would result from the

authorization of the applicant's securities for the purposes mentioned. The Commission points out that if the utility has the legal authority to occupy a certain locality, the Commission has no discretionary powers as to granting authority to such applicant to issue its stocks and bonds for the purpose of securing funds to carry out its purpose in conformity with such legal authority. The Commission reviews its power under the Ohio law as follows:

"The Legislature vested this Commission with the authority to grant a certificate, after public hearing of all parties interested, to a telephone company desiring to exercise any permit, right, license or franchise, etc., in any municipality or locality where there is in operation a telephone company furnishing adequate service, if it finds that the exercising of such license, permit, right or franchise is proper and necessary for the public convenience (Section 614-52, General Code of Ohio).

"The power referred to is the only one of the kind conferred upon this Commission under the laws of Ohio, which goes to show that had the Legislature intended to extend that power to other than telephone companies it would have done so by express terms.

"It is known to members of this Commission that at the time the present Utilities Commission Act was pending before the Fiftieth General Assembly of Ohio prior to passage, an attempt was made to have the power which the intervener is now seeking to have invoked, in its behalf, by the Commission, made a part of the present law, but the same was not included therein, which leads the Commission to conclude that it is without such jurisdiction." The Commission held that it is without authority to withhold its consent to the issue of securities in the present case; and authorized the company to issue its common capital stock of the total par value of $400,000, and its first-mortgage, six-per-cent gold bonds of the total principal sum of $530,000, to be sold for not less than the par value of the capital stock and not less than 90 per cent of the par value of the bonds. The proceeds arising from the sale of these securities are to be used in purchasing the property of the Youngstown Heating Company, and in the construction of an electric plant and distributing system in Youngstown.

WISCONSIN.

The Wisconsin Telephone Company applied for authority to change its toll station at Eagle Point into a rural station. Rural service is being supplied by the Chippewa County Telephone Company, and to grant the request would result in paralleling the rural service lines of the latter company. However, it is not the intention of the Wisconsin Telephone Company to take on additional subscribers in competition with the rural company. The subscribers of the applicant company desire the change contemplated in the application, and if the change is not made the petitioner will undoubtedly lose customers to the impairment of its present investment in the line, which investment was made prior to the law providing against duplication of facilities. The Commission says: "It was evidently the intention of the Legislature to prevent such duplication of investments except in those instances in which peculiar local conditions create a definite public necessity for the extension of the paralleling line. Such instances are naturally but few in number. The danger of permitting paralleling lines lies in the economic waste of having two investments to perform a service that could be performed as well by one and the troublesome disagreements that may arise between two telephone companies that are in competition on the same thoroughfare. Neither of these difficulties inheres in the paralleling permitted in the present instance."

The Commission finds that the paralleling under the conditions in this case will result in no harm to the Chippewa company. "In making this decision we are not unmindful of the evasion of the law that might be accomplished by telephone companies that construct toll lines and then request that they be permitted to convert them into local lines. The Commission will, however, inquire carefully into the circumstances surrounding any application of that nature and it is not intended that the effect of this decision shall be to give the sanction of the Commission generally to such conversions."

The Milwaukee, Light Heat & Traction Company applied for a certificate of public convenience and necessity granting the right to furnish electric service in the village of Delafield. A small amount of electric service is being furnished in the village by E. Humphrey, and the owner of the present plant has entered an objection to the granting of the petition. The present service is inadequate and is not furnished continuously. Numerous business men and residents in Delafield testified that they would use electric current for power during the day and for lighting during the early evening and early morning and during the night in cases of emergency. Such service has not been furnished, and they asserted that this additional service is necessary. The objector stated that he could not increase his equipment so as to furnish continuous service upon the revenue which would be available from such service. The Commission says: "In view of this fact and the further fact that the applicant is ready and willing to furnish continuous service at reasonable rates, we do not feel that the residents of Delafield should be deprived of such service." The application was granted.

Brooks et. al. vs. Barron County Telephone Company. In this case the petition for an extension of lines involved the question as to which of the two companies operating in the territory should be required to make the desired extension. The decision says: "The Supreme Court of Wisconsin has held that a contract between two telephone companies dividing the territory in which they render service is valid, provided such division of territory is not contrary to public policy. (McKinley Telephone Company vs. Cumberland Telephone Company, 152 Wis., 259.) In the present case the agreement between the companies is not in evidence, but the Commission has been apprised of its existence and its provisions do not appear to be inimical to adequate service."

The Wisconsin Telephone Company. The complaint alleges that the Wisconsin Telephone Company furnishes a two-party-line service for one subscriber by bridging at the central office and now charges for this service single-party rates for each instrument so connected. The Commission made an investigation on its own motion and finds that when two separate telephone circuits are bridged at the central office they should be considered as two separate units. The decision says: "The only saving to the compnay from such bridged service as opposed to the operation of two unconnected circuits is that the switchboard work is somewhat lessened; but this saving is offset in some measure by the additional cost of trouble finding and repairing on the bridged lines. Thus from the point of view of the cost of service two circuits bridged at the central office are substantially similar to two unconnected single-party lines. The bridging of circuits at the central office makes it possible for a business man to have his office telephone connected with the instrument at his residence, thus enabling him to answer calls made to his office at his home or vice versa. It is therefore, in a sense, more valuable to him than two separate single-party lines. If a patron's office and home are so located that it is feasible to connect them on a single two-party circuit, such action on the part of the company should not be regarded as a discrimination, provided other subscribers similarly situated with reference to the distributing points are furnished the same service upon request."

Electrical Engineering Problems.

By R. G. Hudson and W. V. Lyon.

DIRECT CURRENTS.

Problem 19.

A solid cast-steel ring, 10 inches in mean diameter and 4 square inches in cross-sectional area, is wound uniformly with 1,000 turns of No. 18 insulated copper wire, the total length of the wire being 650 feet. The magnetization curve for the cast steel is shown in Fig. 20. Assuming the temperature of the winding to be 50 degrees centigrade, find the inductance of the winding when (*a*) an emf. of two volts and (*b*) an emf. of 10 volts is impressed upon the winding. With a wooden ring substituted for the cast-steel ring find the inductance of the winding when (*c*) an emf. of two volts and (*d*) an emf. of 10 volts is impressed upon the winding.

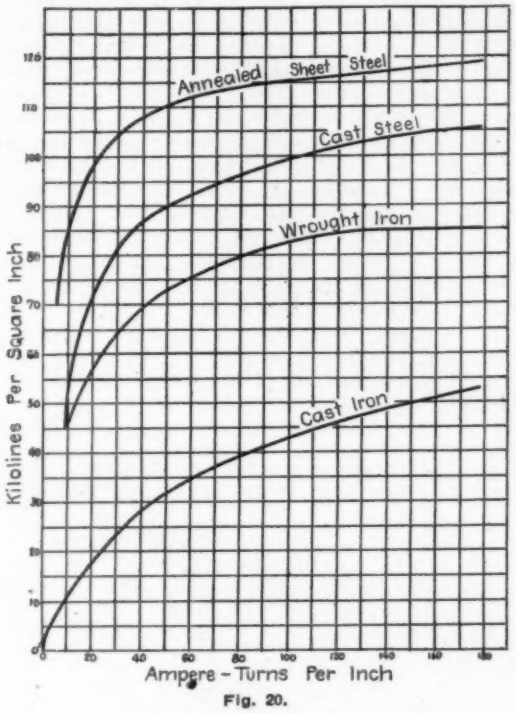


Fig. 20.

ALTERNATING CURRENTS.

Problem 69.

The three-phase generator described in Problem 68 is delivering its rated current to an inductive load at the rated terminal voltage and a power-factor of 0.84. The temperature of the armature winding may be taken as 85 degrees centigrade. In the calculations use the synchronous reactance found from the zero-power-factor curve, as this gives the best results. (*a*) What is the necessary field current? (*b*) With this field current what will be the terminal voltage if the alternator delivers its rated current at unit power-factor? (*c*) If this alternator delivers a condensive load of 4,000 kilowatts at the rated terminal voltage and a power-factor of 0.90, what is the necessary field current? (*d*) What would be the open-circuit terminal voltage if this latter load were removed?

SOLUTION OF PROBLEM 19.

In formula [27] it was shown that when a wire of length (l) is moved at a velocity (v) in a magnetic field of flux density (B) perpendicular to the wire and the direction of the motion, the emf. (E) induced in the wire equals $Blv\times10^{-8}$ volts. If the wire moves uniformly through a distance (d) in time (t) seconds its velocity (v) will be d/t. Substituting this value of (v) in [27] we have

$$E=Bld\times10^{-8}/t$$

Now the flux (ϕ) cut by the wire in moving through the distance (d) must equal $B\,l\,d$. Substituting for ($B\,l\,d$) its equivalent (ϕ),

$$E=\phi\times10^{-8}/t$$

If (N) such wires are connected in series and are moved in a magnetic field so that their emfs. act in the same direction in the series circuit the total emf. induced in this circuit is given by [32]

$$E=N\phi\times10^{-8}/t \text{ volts.}$$

The same emf. will be induced in the conductors if the conductors are fixed and the flux is moved across them. Furthermore if a maganetic flux (ϕ) which threads through or "links" a coil of (N) turns is reduced uniformly to zero in (t) seconds the emf. induced in the coil will be the same as if the flux is moved uniformly from the inside of the coil to the outside in (t) seconds, the emf. in either case being given by [32].

When a current (I) is established in any circuit a magnetic flux is produced which links the circuit. In the case of an electric circuit wound on a magnetic core of known length, area and permeability the resulting flux is given by [25]

$$\phi=3.19NI/(l/\mu A)$$

If (l), (μ), (A) and (N) are fixed, the flux (ϕ) equals KI where the constant (K) equals $3.19\,N\mu A/l$. Substituting for (ϕ) in [32] its equivalent (KI) we have

$$E=(KN\times10^{-8})I/t.$$

The product ($KN\times10^{-8}$) is called the inductance (L) of the circuit and is measured in henries. The emf. induced in a circuit by the variation of its own current is then given by [33]

$$E=LI/t \text{ volts,}$$

where (L) equals the self-inductance in henries and (I/t) equals the rate of change of the current in amperes per second. The direction of this induced emf. is always in such a direction that it will tend to produce a current which will oppose the change of current in the circuit. Thus when the current in any circuit is being increased the self-induced emf. opposes the increase and when the current is being decreased the self-induced emf. tends to maintain the current.

If we equate [32] and [33] we have

$$N\phi\times10^{-8}/t=LI/t \text{ and}$$

[34] $$L=N\phi\times10^{-8}/I \text{ henries.}$$

Answer to Question a.

The resistance of 1,000 feet of No. 18 copper wire at 25 degrees centigrade (see wire table, Problem 4) is 6.51 ohms and the resistance of 650 feet is 0.65×6.51, or 4.23 ohms. The resistance at 50 degrees centigrade is given by [17]

R=4.23 [1+.00385 (50—25)]=4.63 ohms.

When an emf. of two volts is impressed upon this resistance the current by [6] equals 2/4.63=0.432 amperes and the ampere-turns wound on the ring equal 1,000×0.432=432 ampere-turns. Since the mean length of the magnetic circuit equals π×10 or 31.4 inches the ampere-turns per inch equal 432/31.4 or 13.7 ampere-turns per inch. The corresponding flux density on the cast-steel curve (Fig. 20) is 58,000 lines per square inch.

The cross-sectional area of the ring being four square inches, the total flux established in the ring is 4×58,000 or 232,000 lines. The inductance (L) is then given by [34]

$$L=1{,}000\times232{,}000\times10^{-8}/0.432=5.37 \text{ henries.}$$

Answer to Question b.

An emf. of 10 volts will establish a current of 10/4.63 or 2.16 amperes and the ampere-turns per inch will be 2.16×1,000/31.4 or 68.8 ampere-turns per inch. The flux density corresponding is 93,500 lines per square inch. The total flux then equals 93,500×4 or 374,000 lines and the inductance (L) by [34] is

$$L=1{,}000\times374{,}000\times10^{-8}/2.16=1.73 \text{ henries.}$$

Answer to Question c.

If a wooden ring is substituted for the cast-steel ring the flux for a given number of ampere-turns is given by [25]. The current will be 0.432 amperes as obtained in the answer to Question a. Hence

ϕ=3.19×1,000×0.432×4/31.4=175 lines.

Then by [34]

L=1,000×175×10^{-8}/0.432=0.00406 henry.

Answer to Question d.

The current will be 2.16 amperes as found in the Answer to Question b. Hence by [25]

ϕ=3.19×1,000×2.26×4/31.4=879 lines.

Then by [34]

L=1,000×879×10^{-8}/2.16=0.00406 henry.

Comparing the answers to the four questions it should be noted that when a circuit is wound on iron the inductance changes with the current since the permeability varies when the current changes. The inductance of a circuit wound on non-magnetic material is, however, constant independent of the current. The inductance of a circuit wound on iron may be constant within certain limits of current change since the permeability of a piece of iron remains approximately constant for slight changes of current. The results also show that the inductance of a circuit wound on a magnetic material is very much greater than when wound on non-magnetic material. Since the inductance of any circuit is a constant which when multiplied into the rate of change of the current in the circuit gives the emf. induced within the circuit it follows from the results obtained above that while the self-induced emf. produced in a circuit wound on non-magnetic materials is constant for a given rate of change of current, the emf. induced in a circuit wound on magnetic materials is not the same for a given rate of change of current since the inductance depends upon the degree of magnetic saturation at which the current change is taking place.

SOLUTION OF PROBLEM 69.

Answer to Question a.

The true resistance per phase at 25 degrees centigrade is

$$R_{25}=0.084/2$$
$$=0.042 \text{ ohm.}$$

The amount by which the effective resistance is greater than the true resistance at 25 degrees centigrade is

$$1.55\times0.042—0.042$$
$$=0.0231 \text{ ohm.}$$

The true resistance per phase at 85 degrees is found by the formula previously given.

$$R_{85}=0.042[1+(85—25)/(234.5+25)]$$
$$=0.042\times1.23$$
$$=0.0517 \text{ ohm.}$$

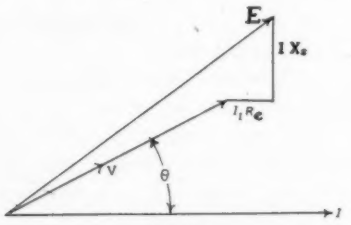


Fig. 19a

The effective resistance per phase at 85 degrees is

$$R_e=0.0517+0.0231$$
$$=0.0748 \text{ ohm.}$$

The synchronous reactance calculated from the open-circuit and the zero-power-factor characteristic is

$$X_s=(7{,}950—6{,}600)/438\sqrt{3}$$
$$=1.78 \text{ ohms.}$$

The vector diagram which is used in calculating the performance of an alternator is given in Fig. 19a. V is the terminal voltage per phase and is 6,600/$\sqrt{3}$ or 3,810 volts.

I is the full-load armature current per phase and is 5,000/3×3.81 or 438 amperes.

Θ is the angle whose cosine equals 0.84. The current is shown to be lagging behind the terminal voltage.

By [22a] IR_e=438×0.0748
=32.8 volts.

By [23a] IX_s=438×1.78
=780 volts.

The horizontal component of the terminal voltage is

$$V_h=3{,}810\times0.84$$
$$=3{,}200.$$

The vertical component of the terminal voltage is

$$V_v=3{,}810\times0.542$$
$$=2{,}065$$

$$\left\{\text{Sin } \Theta=\sqrt{1—\text{Cos}^2\Theta}=\sqrt{1—0.84^2}\right\}$$
$$=0.542$$

By [19a] E_h=3,200+32.8
=3,233

and E_v=2,065+780
=2,845

By [20a] $E=\sqrt{3{,}233^2+2{,}845^2}$
=4,307 volts.

This is the excitation voltage per phase. It is the value to which the phase terminal voltage would rise if the load were removed and the field excitation unchanged. The terminal excitation voltage is

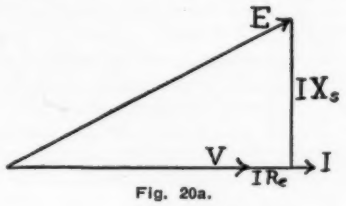


Fig. 20a.

$$4{,}307\sqrt{3}=7{,}460 \text{ volts.}$$

The necessary value of the field current to produce this terminal voltage on open circuit is found from the characteristic and is

I_f=200+55(7,460—7,400)/(7,950—7,400)
=206 amperes.

Answer to Question b.

The vector diagram is given in Fig. 20a. The current still has its full-load value and the resistance and synchronous reactance drops are unchanged. Since the field current is unchanged the excitation voltage, E, is still 4,307 volts per phase. The terminal voltage per phase is, however, unknown.

By [19a] $E_h=V+33$

and $E_v=0+780$

By [20a] $E=\sqrt{(V+33)^2+780^2}$

or $E^2—780^2=(V+33)^2$

and $V=\sqrt{E^2—780^2}—33$

Since E=4,307 volts,

V=4,200.

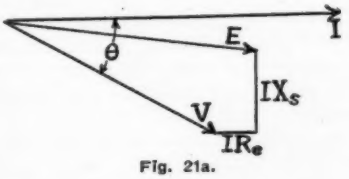


Fig. 21a.

This is the phase terminal voltage. The line voltage is

$$4{,}200\sqrt{3}=7{,}270 \text{ volts.}$$

Observe that the terminal voltage increases 10 per cent if, while the armature current has its full-load value, the power-factor is increased from 84 per cent lagging to unity.

Answer to Question c.

The vector diagram is given in Fig. 21a. The total kilovolt-amperes equal

$$4{,}000/0.90=4{,}450.$$

The kilovolt-amperes per phase equal

$$4{,}450/3=1{,}480.$$

The current per phase, that is, the armature current, equals

$$1{,}480/3.81=389.$$

By [22a] $IR_e=389\times0.0748$
$=29$ volts.
By [23a] $IX_s=389\times1.78$
$=692$ volts.

The horizontal component of the terminal voltage is

$$V_h=3,810\times0.90$$
$$=3,430.$$

The vertical component is

$$V_v=-3,810\times0.436$$
$$=-1,660$$
$$(\text{Sin }\Theta=0.436).$$

The minus sign is used because with a leading current the vertical component of V is drawn downward instead of upward, as it would be if the current were lagging.

By [19a] $E_h=3,430+29$
$=3,459$
and $E_v=-1,660+692$
$=-968.$

By [20a] $E=\sqrt{3,459^2+(-968)^2}$
$=3,595$ volts.

The terminal excitation voltage is

$$3,595\ \sqrt{3}=6,220 \text{ volts.}$$

The field excitation necessary to produce this voltage is

$$I_f=100+50(6,220-4,800)/(6,500-4,800)$$
$=142$ amperes.

Answer to Question d.

The excitation voltage is 6,220 volts. Observe that this value is 7 per cent less than the terminal voltage under load. That is, the terminal voltage decreases as the load is taken off. This is a characteristic of capacity loads in general.

Compare these vector diagrams with those for finding the relation between the voltages at the ends of a transmission line. See Problem 55. The excitation voltage, E, corresponds to the voltage at the power station and the terminal voltage, V, corresponds to the voltage at the load. Fig. 21a shows that it is possible, if the current is leading, to have the voltage at the load greater than the voltage at the power station. This fact is of considerable practical importance. It could never occur in direct-current transmission.

The regulation of an alternator is the percentage change in the terminal voltage when a given load is removed and the field current is maintained constant. In **Question a** if the load were removed the terminal voltage would rise to 7,460 volts. The regulation in this case is

$$100(7,460-6,600)/6,600=13 \text{ per cent.}$$

In **Question b** the terminal voltage under load is 7,270 volts, while the excitation voltage is the same as in **a.**

$$\text{Regulation}=100(7,460-7,270)/7,270$$
$=2.6$ per cent.

In **Question c** the regulation would be negative, since the voltage falls when the load is removed.

$$\text{Regulation}=-100(6,600-6,220)/6,600$$
$=-5.8$ per cent.

DIRECT CURRENTS.

Problem 20.

When the field coils of a four-pole dynamo (see Fig. 19) are connected in series and carry a current of 8.7 amperes, the flux linked with each field coil is 13,200 kilolines. Assuming that each field coil contains 725 turns as obtained in Problem 18, find (*a*) the inductance of the field circuit; (*b*) the inductance of one field coil, and (*c*) the energy stored in the magnetic field of the dynamo. If a non-inductive resistance of 10,000 ohms is connected inside the field switch and in parallel with the field circuit, find (*d*) the potential drop in this resistance just after the field switch is opened.

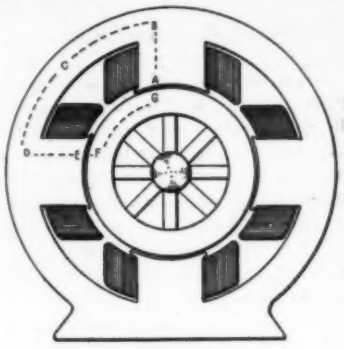


Fig. 19.

This problem illustrates the effect of inductance in the field circuit of a dynamo.

ALTERNATING CURRENTS.

Problem 70.

The three-phase alternator described in Problem 68 delivers its full-load current at the rated terminal voltage to an inductive load operating at a power-factor of 0.84. The temperature of the armature winding may be taken as 85 degrees centigrade. In the following calculations, use the magnetomotive force, or reaction, method and find the reaction of the armature in terms of field current from the open-circuit and zero-power-factor characteristics. (*a*) What is the necessary field current? (*b*) With the same field current, what will be the terminal voltage if the alternator full-load current has unit power-factor? (*c*) If this alternator delivers 4,000 kilowatts at the rated voltage to a condensive load operating at a power-factor of 0.90, what is the necessary field current? (*d*) What would be the open-circuit, or excitation, voltage if this load were removed?

This problem illustrates the magnetomotive-force method of calculating the performance of an alternator.

Solutions of the above problems and two new problems will be printed in the next issue.

Electrification of East Prussia Proposed.

Count Mirbach-Sorquitten has submitted a comprehensive proposal to the Prussian Ministry and the chief of the Province of East Prussia, suggesting the allocation out of state funds of a considerable endowment for the electrification of that province, which is said to have been severely damaged. As the basis for the proposal the Count points out the dearth of labor and the scarcity of horses, which offer insurmountable difficulties in the way of the revival of economic activity. It is held that the only remedy is to proceed with the establishment of great power works.

"Standard Wiring" for 1915.

The twenty-first annual edition of "Standard Wiring" is ready for delivery. This publication, which has been recognized as a national authority on electric light and power wiring, has been officially adopted by the National Electric Light Association and by the Society for Electrical Development, Incorporated. In addition to the customary wiring tables, formulas and rulings in accordance with the National Electrical Code, the 1915 edition contains a special section of 50 pages on house wiring. The book is bound in flexible leather cover and contains 320 pages with copious illustrations.

EXPORT TRADE AND HOW TO GET IT.—II.

By G. F. Bagge-Féron.

Responsibility and Reciprocity.

From the first article in this series it will have been noted that the chief difference between foreign trade and interstate commerce is in the time and distance involved in each transaction. Foreign buyers are in general quite as responsible as domestic purchasers, and are equally entitled to reasonable business methods. The risks must be met half way by both the parties. It is absolutely absurd to look at the proposition from one standpoint only, which is too often the case with the manufacturer who declares that he will send goods on no other conditions than "Cash against shipping documents." Under the latter condition the buyer must assume all the risks without the slightest guarantee.

For example, cases have frequently arisen where the goods arrived at their destination in defective condition, only on account of careless or incompetent packing. For instance, what shipper has not heard of cases where shipments of office furniture, like roll-top desks, were entirely spoiled and broken because the crating was made of too frail material? The buyer had paid cash f. o. b. American port, and received only loss and trouble from the transaction, even if he finally could recover from the insurance company the indemnity to which he was entitled. In this and similar cases the fault is almost entirely with the sender, who will hardly be willing to make good with a new shipment; even if he did this it will involve a loss for the buyer, on account of the added delay in final receipt of salable goods. In some cases the goods that were spoiled have fallen into the hands of individuals who, through their minute examination thereof, have obtained valuable information which permitted them to start making the goods in their own country.

From this it is evident that the exporter must convince the prospective purchaser that he can deliver the goods, not only in a specified time, but also in perfect condition. If he can guarantee this he will have satisfied customers, who will stick to him for repeat orders, because purchasers, in Latin America particularly, are not inclined to change the house they deal with merely on account of a little difference in price, since this may frequently involve other complications.

In order to facilitate ascertaining the business standing of the two parties to the transactions. manufacturer and buyer, it is advisable to utilize the medium of statements issued by the most reliable commercial agencies, such as Dun and Bradstreet, which have branches in all of the large cities abroad, from whom both the buyer and seller can obtain the business standing of the other party. Business reference should appear on the business letters of the manufacturing firm, and also in its advertisements and other trade literature. It is evident that this small trouble of adding the references, from whom knowledge of the status of the firm can be obtained, is very valuable in facilitating business transactions, and particularly in the foreign field.

A typical letter head suitable for the foreign correspondence of an American manufacturer is shown below:

Telephone:
North 37,891
Automatic 689,416.

Cable Address:
"Electric, Chicago."

Codes:
Lieber's
A. B. C. 4th and 5th Editions
Western Union.

Bankers:
First National Bank, Chicago.
National City Bank, New York.

CHICAGO ELECTRIC CO.
2600 NORTH STATE STREET,
CHICAGO, ILL., U. S. A.

Reference Registered:
R. G. Dun & Co.,
Havana,
Rio de Janeiro,
Buenos Aires,
Rosario,
Valparaiso.

In reply please refer to.....

On the other hand, a foreign buyer should also have his business standing listed in the principal branch offices of the mercantile agencies in the United States, as, for instance, New York, Chicago, San Francisco, New Orleans, etc. He should also let this appear on his business stationery. Thus when writing to an American firm the latter can at once obtain a report on the status of the prospective purchaser without the delay of six to ten weeks that would be involved without this American listing. Thus mutual confidence for future business transactions is established rapidly, and all interests at both ends eliminate reasons for further doubt, and get to know each other quite well simply by utilizing the mediums existing in the most practical manner.

The following letter head is typical of a foreign concern:

Telefono:
Avenida 366.

Direccion telegrafica:
"Alba, Mendoza."

Codigos:
Lieber's.

Bancos:
River Plata Bank,
Mendoza,
Buenos Aires.

MANUEL ALBA Y CIA.
MENDOZA, ARGENTINA.
CALLE FLORIDA 376.

Referencia Registrada:
R. G. Dun & Co.,
New York, Chicago,
Madrid, London,
Paris.

Ref. No. .....

Payments.

Before taking up the technical points of special interest to electrical manufacturers and exporters, it is well to call attention to the usual methods of handling oversea payments which have been developed to be quite as safe as in any domestic business. As pointed out before, business on the cash basis is almost impossible to obtain, except under very exceptional conditions. It is quite reasonable to meet the purchaser half way, which is usually done by sight or time drafts. It must be remembered that the termination of any transaction takes from three to six months, or even longer; in fact, it may take the purchaser from three to six months alone to dispose of the goods he has ordered in substantial quantity in order to reduce the overhead expenses. Since it has taken the manufacturer from three to almost six months to get the goods into the buyer's possession, it is evident that the final disposal of the goods may involve well up to one year. Of course the final charge for such a long lapse of time (that is, the addition of interest on the capital tied up) must come out of the customer's pocket. However, the customers in the South are quite up to date. They like the best, and find the means for gratifying their wants, and sometimes pay prices for goods they desire, which would seem to us unheard of.

Assuming that there has been received a telegraphic order from a responsible firm for a good-size shipment, on the condition c. i. f., Bahia Blanca, Argentina, draft against shipping documents, this would mean that the goods are to be delivered, or rather the bill of lading is to be handed to the agent of the buyer when he has accepted the draft, which is to be paid, say, six months from the date of ship-

ment from the factory. The manufacturer's forwarding agent in the United States takes care of handling the entire oversea transaction, and the manufacturer gets the accepted draft in his hands. This draft is quite as good as cash, if the house which ordered the shipment has the normal commercial standing in its home city. This draft can be discounted by any New York bank, and at present there are 72 banks in New York City that carry on foreign-exchange business. Thus the manufacturer can use the cash at all times, before the buyer really pays. This discount expense, plus the interest on the money tied up, is simply added to the selling price, and the client is quite willing to pay for anything in this line that is customary. There is absolutely nothing peculiar to the whole system, except that it takes a longer time from beginning to end of a transaction. On account of the intimate relation of commercial agencies in different nations, it is simple and safe. If the orders will seem to one large, the only thing necessary is to be exceptionally prudent, and to investigate carefully the prospective client. There are plenty of them abroad who are as good as gold, but as a rule they do not see any reason why they should lend the exporter cash in order to enable him to carry on his export trade, which is, in fact, what any c. o. d. condition would amount to.

Foreign Investments.

The whole problem is based on close mutual understanding and confidence. There is absolutely no need for immediate investment of American capital in foreign countries in order to develop an export trade, although it certainly facilitates the foreign buyer in deciding to deal preferably with that country which has investments in his line; but this matter of foreign investments will come by and by, when the American capitalist sees his way clearer than at the present time, and has become somewhat more familiar with the value and magnitude of the business prospects existing abroad. There are many concessions and industrial undertakings awaiting the time when capital will be ready to act. In many of the countries to the South the governments give specially favorable conditions and guarantees for new capital investments. If this had not been the case Europe would as well have been slow in conquering the field. There is a very large number of municipalities that wish the advantages of electric light and power, whether electricity is produced by steam, gas or fuel-oil plants, or in water-power projects. It is frequently possible, in undertaking such municipal or government projects, to procure the special privilege of entering the principal machinery partly or entirely without paying the usual customs duties. Aside from new projects there are many communities of considerable size which have been growing very rapidly and need very urgently modernization and extension of plants already in existence. There are obtainable many mining concessions combined with power plants, where the electrical energy can be supplied with great profit for lighting, power, and communication purposes, besides furnishing the energy needed for running the mining establishment.

Value of Foreign Trade From Industrial Standpoint.

In a German paper it was stated not long ago that what American industry needs, in order to overcome momentary depression in domestic markets, is a safety valve in export trade. This has largely been found in Canada, but there is no reason why the outlet afforded by this safety valve cannot be extended toward the South. Since now the Panama Canal is in operation and the whole business situation throughout the entire world has undergone a complete change on account of the lamentable trouble in Europe, the time is peculiarly favorable for the extension of American business abroad. From what I personally know from my visits to the southern countries, I would say that if the advancement of our export relations with the southern countries continues at the same slow rate which it has pursued, the people in those countries will be compelled to find means themselves for starting manufacturing which, up to the present time, has been carried on to only a very limited extent. In the end, when the American manufacturer would finally be ready to enter the foreign field actively, as he is bound ultimately to secure an outlet for his products to keep his factory and hands busy, he will find it much harder to obtain a foothold than if he acts in the near future.

Local Electrical Conditions in Buenos Aires.

The following data, obtained from a European paper, will illustrate the growth of business in the city of Buenos Aires, the capital of Argentina, and may, therefore, prove of interest. In the year 1900 horse-driven street cars carried 95,000,000 passengers, and the electrically driven street railways carried 30,000,000. Ten years later, that is 1910, the horse-driven railways carried 30,000,000 and the electric railways 260,000,000 passengers. This shows effectively the tremendous advance of electrical enterprises. Another example may be cited. In 1904 the number of electric motors used for industrial purposes in Buenos Aires totaled 522; in 1910 the number was 7,466, an increase in six years of 6,944. This extension of the use of electricity is continuing very rapidly.

Since this enterprising Argentine city has been supplied with generating machinery for electrical central stations from many different European countries during the last decade, a rather mixed generation and distribution system prevails. Furthermore, the equipment and materials used in installation, both large and small, are very varied. In the earlier plants the most primitive method of installation was followed, whereas in the most recent ones most up-to-date and efficient equipment is found. The principal electric light company is controlled by German interests, who have nearly always bought German equipment. Of the other central stations some belonged to Italian, Belgian, French, English, and other companies, who made their purchases in their respective countries. Subsequently the German company, by purchasing many of the competing plants, established something of a monopoly for the supply of current, not only for public lighting, but also for the private supply of electricity for light and power and for the current used by the entire street-railway system. The latter is combined with the light and power distribution. All distribution is made by underground cables throughout. In some cases the energy is transmitted from the generating stations to a number of intermediate transformer substations, where the voltage is stepped down and the energy transmitted to converter substations, from which the final distribution takes place. The substations are tied together for emergency supply. Lately new foreign and national interests have started new plants through recently granted concessions and the competition is now quite keen.

The following tables give interesting data on the principal generating systems in the city. Polyphase plants are almost invariably three phase.

Several of these substations have storage batteries as auxiliaries, the one in the Posadas station having a rated capacity of 12,000 ampere-hours. From the third table it is evident that the prevailing distribution is direct current for lighting, power and traction purposes. Lighting and the smaller appliances and motors are practically always 220 volts. Larger motors are direct current 440 volts and sometimes 500 volts. Both single-phase and polyphase motors are being introduced, and quite a few are already in use. These are usually 50 cycles and 110, 220 or 300 volts depending on size.

Besides the plants listed, there operates in Buenos Aires also the Compania

BUENOS AIRES GENERATING PLANTS.

Station	Kind of Current	Frequency	Voltage
Dock Sud	Polyphase	25 and 50	13,000
Boca	Polyphase	25	6,600
Paraguay	Direct current (3-wire)	..	450-225
	Direct current	..	600
Paseo de Julee	Polyphase	50	3,250
Cuyo	Direct current (3-wire)	..	450-225
La Capital	Direct current	..	580
Moron	Direct current (3-wire)	..	450-225
Lacroze	Direct current	..	550

TRANSFORMER SUBSTATIONS.

Substation	Capacity (K.W.)	Frequency	Primary (volts)	Secondary
Brandzen	3,000	50	12,500	6,600
Herrera	2,000	50	12,500	6,600
Pinzon, Montes de Oca	2,000	50	12,500	6,600
Azopardo	2,000	50	12,500	3,300
Montevideo	2,000	50	12,500	3,300
Banfield	1,200	50	12,500	2,200
Vidal	750	50	12,500	12,500

CONVERTER SUBSTATIONS.

Substation	Capacity K. W.	Frequency Cycles	Primary Volts	D. C. Volts	Use
Bustamante	4,200	25	6,300	500	L. & P.
				550	T.
Pozos	3,800	25	6,300	500	L. & P.
Posadas	3,000	25	12,500	500	L. & P.
Salta	2,600	25	6,300	550	T.
Paseo Colon	2,400	25	6,300	500	L. & P.
				550	T.
Uruguay	2,000	25	6,300	550	T.
Humberto I	1,750	25	6,300	550	L. & P.
Guemes	1,200	25	6,300	550	L. & P.
Barraca Ocampo	1,200	25	12,500	550	T.
Flores	1,200	25	6,300	440	L. & P.
				550	T.
Belgrano	600	25	12,500	550	T.
Quilmes	540	50	6,300	500	L. & P.
				550	T.

L. & P. = Light and power.
T = Traction (street-railway service).

Italo-Argentina de Electricidad, which has a new and modern 20,000-kilowatt generating plant, containing Diesel engines and supplies energy for light and power in competition with the other companies. It also furnishes energy to the city for the operation of 2,000 street arc lamps.

In Buenos Aires there has been put in operation recently a passenger subway, running from the Plaza Mayo to the Plaza Once, the latter being the terminal of the Buenos Aires Western Railway Company. This company intends to electrify its line 36 kilometers (22.3 miles) inland from the Plaza Once to Moreno; this line works in conjunction with the company's freight subway from the terminal to the port.

Provincial Argentine Plants.

The Argentine Republic contains the following 14 provinces, given in the order of their importance: Buenos Aires, Santa Fe, Entre Rios, Corrientes, Cordoba, San Luis, Mendoza, San Juan, La Rioja, Catamarca, Santiago, Tucuman, Salta and Jujuy.

In the province of Buenos Aires, outside of the capital city, there are quite a few generating plants. The following table gives the characteristics of the most important stations:

City	Kind of Current	Voltage
Bahia Blanca	Polyphase, 25 cycles	5,000
	Direct current	150 and 550
Bahia Blanca	Single phase, 50 cycles	500
Bahia Blanca (War Dept.)	Direct current	500 and 220-110
La Plata	Direct current	550
Mar del Plata	Direct current	450-225
Azul	Direct current	450-225
Chivilcoy	Direct current	550
Avellaneda	Direct current	440-220
Tres Arroyos	Direct current	440-220
San Martin	Direct current	440-220
	Single phase, 50 cycles	2,500
San Nicolas	Direct current	440-220
San Pedro	Direct current	220
Quilmes	Polyphase	2,300
	Direct current	440-220
Lomas de Zamorra	Polyphase, 50 cycles	6,300/2,500/110
Adrogue	Single phase	2,500/220-110

At Santa Fe and Rosario in Santa Fe Province are direct-current plants operating at 500 volts and 440-220 volts, respectively. At Cordoba is a polyphase plant with 700-volt generating plant and 11,000 and 2,000-volt transmission lines, the local distribution being 230-115 volts. At San Luis the plant supplies direct current at 440-220 volts. At Trapiche and Cachueta, in Mendoza Province, the polyphase supply is 50 cycles, generated at 5,000 and distributed at 225 volts. At Zonda and Concepcion, San Juan Province, polyphase 50-cycle supply prevails at 500/10,000/210 volts. At Tucuman direct current is supplied at 500 volts, at Catamarca direct current at 220 volts, and at Santiago del Estero, Salta, Jujuy, and the tunnel station La Cuevas the direct current is 440-220 volts.

The Sociedad de Electricidad del Rosario, Rosario de Santa Fe, operates a new plant, since early in 1913, of 18,000-kilowatts capacity. It supplies energy for public lighting by 1,500 arc lamps, besides having a supply to all private customers. Alberdi, near Rosario, has recently had electric light installed throughout the city. The city of Trenque Langue has a new power plant with two Sulzer-Diesel engines driving generators for a direct-current, three-wire system operating at 440-220 volts.

The Compania de Luz y Fuerza, of Mendoza, is enlarging its plant with Diesel-engine-driven equipment. Compania Hidro Electrica de Tucuman, of Tucuman, has a new plant for supplying energy for public and private lighting and for the electric-railway line (1,200 volts). Sociedad para Empresas Electricas, of Buenos Aires, also controls the electric lighting in Bragado, Necochea, San Juan and Resistencia. Compania Anglo-Argentina, of Buenos Aires, has bought the power plant and local electrical company in Villa Mercedes.

Compania Andina de Electricidad owns a hydroelectric plant on the Rio San Juan, about six miles from the city of San Juan, and transmits about 2,700 horsepower to the city at 11,000 volts. Compania de Electricidad de la Provincia de Buenos Aires owns plants in Junin (recently enlarged) and Azul. In the latter city, the municipality some time ago organized a co-operative undertaking to build a competing plant. Companio de Luz y Tranvias del Norte, Salta, operates an electric railway to the coast.

As to the lamp sockets used in Argentina, in the city of Buenos Aires they are, for the most part, of the Edison screw-base type, and the Ediswan (English) or bayonet-base type. Many candelabra-base lamps are also used.

From the foregoing data of the principal electrical plants in Argentina, it will be easy to get some idea of the varied nature of the development of electrical industry in that country. Argentina has advanced quite remarkably in this respect, compared to most of the other South American countries, but is still in its comparatively early electrical-development state.

Prospects for the electrical field are so immense there that it is impossible to go into this matter in any detail in this brief article. When the development of the oil fields in the interior of the country has been more advanced, so that the fuel supply will be more abundant and easily obtained, much electrical development must result. This also is true respecting hydroelectric plants, for the construction of which there are numerous water powers available.

There is, it is evident, an excellent opportunity for the sale of every kind of electrical material. In the smaller towns the distribution systems are, of course, overhead, and the size of the plant installation in general is moderate, because of the prevalence of one and two-story houses. In the large cities, however, the most up-to-date wiring system in conduit will be found. In other words, a large variety of material and types of installation exist. The German Electrical Code has been adopted in Argentina for all electrical work, in accordance with the recommendations of the electrotechnical con-

gress held in Buenos Aires in February, 1913. The trade journal *La Ingeniería* issued in Buenos Aires, is a good medium for advertising any kind of electrical goods.

Need for Special Equipment.

In order to make any headway in Argentina, as well as in most of the Latin-American countries, a traveling salesman from a manufacturer must have a very intimate knowledge of the entire line he sells, and also of the possibility of his firm making special types slightly varied from the standard line. Thus, if he gets an opening for some special material in his line which the prospect has formerly been buying from a European exporter, and if the client insists on getting identically this same type that he has been using for years, the salesman should be able to state immediately whether the exact article can be supplied, and the approximate price, which must include the extra expenditure for any tools and dies which may be necessary to turn out the article in question, dependent on the size of the order involved. To push the sale of only those goods that are standard in the United States is a serious error, because the climatic conditions in the tropical countries have much to do with apparently insignificant details. Both on account of excessive moisture and the abundance of insects, electrical material must be guarded against difficulties, such as short-circuits, that might be brought about if special provision is not made to counteract this.

(To be continued.)

Columbus Jovian Meeting.

Jovians of Columbus, O., started 1915 activities on January 7, with a noonday luncheon at the Virginia Hotel, at which 58 members were present. W. W. Winship, of Philadelphia, past senator-at-large, was the speaker of the occasion. His talk was on the growth of the Jovian Order throughout the country, and the best methods of recruiting.

Reports were heard from committees appointed at the last meeting before the holidays. Their activities were discussed informally, particularly with respect to the rejuvenation, which is to be held in February. A financial plan is being worked out which will provide the means for larger usefulness to the entire electrical industry.

Rejuvenation in Chicago.

The first Jovian rejuvenation of the new year will be conducted at the Hotel Sherman, Chicago, on Monday evening, January 18.

An interesting entertainment program is being arranged. E. W. Donoho is chairman of the Membership Committee.

SHORT-CIRCUIT CONDITIONS ON TRANSMISSION SYSTEMS.

Monthly Meeting of American Institute of Electrical Engineers.

The 303rd meeting of the American Institute of Electrical Engineers was held at the Engineering Societies Building, New York City, on the evening of Friday, January 8. President Paul M. Lincoln called the meeting to order at 8:20 p. m. A paper was presented by I. W. Gross, entitled "Theoretical Investigation of Electric Transmission Systems Under Short-Circuit Conditions."

The parts of a high-tension system for which protection must be furnished under short-circuit conditions are: (1) oil switches against absolute failure; (2) generators, transformers, busbars, underground cables, against mechanical forces; (3) all apparatus against overheating; (4) the system as a whole against complete shut-down. The use of reactors is only fully effective when they limit the short-circuit current to meet all of these conditions. Oil switches for 11,000-volt, three-phase systems can be obtained to handle short-circuit currents of 36,800 amperes (r. m. s. value). The author first investigated the mechanical forces due to excessive currents in electrical apparatus, and especially in underground cables and busbars. In a three-phase cable of size 3/0, carrying 70,000 amperes, the force is over one ton per foot. The greater spacing of busbars keeps the force to a lower value, but with a 20-inch triangular spacing and 100,000 amperes, the force reaches 100 pounds per foot. With supports nine feet apart, the force on one support is nearly one-half ton. Curves are plotted showing the relation between force and current. The heating of the conductors of the cable from the instant of short-circuit to a time 0.8 second later was traced analytically during the transient state of the current, and typical computed heating curves presented. The maximum current occurs with an asymmetrical wave, which is produced when the instant of short-circuit coincides with zero voltage. The temperature rise in this case may be considerably greater than for a symmetrical current wave. The insulation of the cable may be endangered in the very short time it takes an oil switch to operate, and consequently the heating may be the limiting feature in controlling a short-circuit. The maximum temperature may be limited by increasing the cross-section of the cable. Present schemes of introducing reactors in power circuits are as follows: (1) reactance in generators and generator leads; (2) reactance in separate feeders; (3) reactance in main power-house bus between generators. Also various combinations of these may be used. The author then described a method, suggested by H. G. Stott, which has proved of merit. It consists in paralleling all generators through reactors on a synchronizing or transfer bus, and taking power through a separate set of reactors directly from each generator, rather than from the synchronizing or main station bus. This scheme was analyzed at length, and the possible short-circuit currents determined. This method is extremely flexible and effective. It limits the current to a safe value without an excessive reactance in the circuit. It also protects the machines against mechanical injury, due to poor synchronizing, and can transmit power with less voltage drop than with the bus-reactance scheme. It makes possible the use of generators having low inherent reactance, provided the machine is designed to withstand dead short-circuit at its terminals. The lower the reactance of the generator, the less possibility there is of synchronous apparatus on the system dropping out of step. The method of plain feeder reactance is not fully effective, as trouble on the main station bus is almost certain to cause synchronous apparatus to drop out of step. Station busbar reactance is effective under short-circuit conditions, but is objectionable under normal operation on account of the large voltage drop in transmitting power from one end of the bus to the other. The effect of paralleling feeders at the substation end was also considered.

The discussion was opened by Henry G. Stott, who mentioned the conditions giving rise to the study of this problem. The power station is designed for six 30,000-kilowatt units, but it was found that the feeders and busbars, rather than the generators themselves, needed protection. The first impulse was to insert reactors in each feeder, but it turned out that these would be too large to be practicable. The insertion of reactors in the busbars presented the objection of enormous voltage drops. The scheme described was finally hit upon. The enormous forces and temperatures found to be possible were astonishing. With the arrangement of reactors shown, it is hoped to limit short-circuit currents to about 22,000 amperes, which can be handled by the oil switches.

Philip Torchio told of putting locking devices on disconnecting switches to prevent them from opening under short-circuit; also of insulation being destroyed by heating due to short-circuit. He proceeded to discuss different methods of protection by means of reactance, and emphasized the importance of the problem of protection. He preferred a scheme of feeder reactance and bus reactance to the one proposed by Mr. Gross. Engineers ought to come to some definite conclusions and agreement as to the best methods of protection. In Europe it is considered safer not to centralize. In Berlin, for example, different stations supplying different territories are run independently, and not tied together. He considered the methods in use in this country preferable, however.

Cassius M. Davis pointed out that the existing conditions could not be determined with accuracy. Thus the generator reactance is not exactly known. The rate at which the short-circuit current in it dies down is not well known. The resistance of the so-

called short-circuit must be assumed. In practice, probably only one phase of a polyphase circuit is short-circuited. The back feed from synchronizing apparatus in substations is not exactly known, and yet this may be an important part of the total power at short-circuit. The problem is, therefore, one in which many conditions must be assumed. He discussed new methods of determining approximately the value of the current on short-circuit conditions. Mr. Davis favored the scheme proposed by Mr. Gross. He had derived formulas for the temperature rise, assuming direct rather than alternating current of the same effective value, which he explained. These formulas gave values differing slightly from those found by Mr. Gross.

H. R. Woodrow said the especial advantage of feeder reactance is where feeders are paralleled in the substations. Oil switches for the maximum breaking capacity mentioned by Mr. Gross are large and expensive, and a further reduction of the maximum current is often warranted in order to permit the use of smaller switches. He pointed out that the maximum forces occurring are twice the average forces computed in the paper. He did not think the arrangement of buses in a straight line would reduce the maximum stress as much as was calculated by the author. He also pointed out the enormous forces arising at a right-angle bend of the conductor. If a conductor is heated 100 degrees or more, its resistance will rise 35 or 40 per cent, which will increase the amount of heat liberated. However, as the author did not allow for any absorption of heat by the insulation, these two omissions might offset each other. He claimed that equations 17 and 18, given by Mr. Gross, were in error, and gave the correct values.

James Lyman said that the great problem is to get the minimum reactance to give the maximum protection. He formerly thought that by proper protection feeders could generally be run in parallel, but now finds the tendency in the opposite direction.

John B. Taylor thought more attention should be given to the calculation of maximum temperature in the cables. The resistance co-efficient of temperature of the conductor should be considered. The insulation does not absorb much heat because, although its specific heat is higher than that of the copper, its mass is comparatively small.

R. W. Atkinson pointed out that the maximum force, which is the important thing, may be double that computed for a symmetrical wave, and more than four times as great for an asymmetrical wave. While the strength of the insulating paper is amply sufficient to resist the forces developed when the cable is new, this strength may deteriorate very much with time and use. Overheating of the cable will reduce the strength. Such material may for a short time withstand temperatures of 200 or 300 degrees centrigrade without serious change. He described experiments in sending enough current through a No. 8 conductor to melt it. The two layers of insulation next to the conductor were completely charged, but the remainder were not affected. A large amount of gas was given off, however, and this might destroy the lead cover of a cable.

Charles L. G. Fortescue said that the degree of protection made against any contingency should be based on its probable frequency, and the extent of damage that would result. Short-circuits are much more liable in feeders than in station buses, and therefore protection should be designed to relieve such a feeder with the least possible disturbance to the system. A design which permits short-circuit in a single feeder to cause as much disturbance as a short-circuit at the bus is inadequate. He consequently favored a combination of the scheme of Mr. Gross and the feeder-reactance scheme.

Hans Lippelt favored transmission with direct high voltage. This obviates the low power-factor introduced by reactors with the accompanying decrease in capacity. Reactors can be used on a direct-current system and can be provided with iron cores. A short-circuit current can then not rise quickly to its maximum value, and this maximum is also limited. Switches can be provided which, instead of breaking the circuit, introduce resistance. The effect of lightning can also be localized by such choke coils. The Thury system has given great satisfaction and is being used in a power-transmission line between Sweden and Denmark for a voltage of 90,000. The cables are laid on the bottom of the sea, and it was not found economical to use alternating current.

In closing the discussion, Mr. Gross pointed out why it was impossible to use Mr. Torchio's scheme for the power station in question. There are cases, however, where busbar and feeder reactances are suitable.

Institute Conventions in 1915.

The American Institute of Electrical Engineers will hold a midwinter convention in New York City on February 17, 18 and 19.

The usual summer convention will be held in the East the latter part of June.

A Panama-Pacific convention will be held in San Francisco during the week beginning September 13. This will immediately precede the International Engineering Congress.

Chicago Jovian League.

E. N. Hurley, of the Hurley Machine Company, and president of the Illinois Manufacturers' Association, was the principal speaker at the Jovian League meeting in Chicago on January 11. He spoke on the subject of "Our Trade Relations with South America," referring particularly to personal observations on a recent trip through the country in question. Mr. Hurley explained that electrical development in South America is comparable with the development in this coutnry from almost every standpoint. However, with the possible exception of Brazil, European capital and equipment is exclusively employed, although many of the executives and operators of the utilities are natives of the United States.

Mr. Hurley said that all of us are anxious to increase our business—but, too many of us are inclined to pay undue attention to what our competitors are doing, borrowing trouble about dull times, and worrying over the future of our country. "If we paid more attention to our own affairs we would have ample time to ascertain the actual cost of producing our goods and the cost of selling them.

"If we were to put our houses in order, get at the real facts regarding the cost of our products, establish an up to date method of accounting, charge off liberally for depreciation and present balance sheets in accordance with good business practices, we would be in a position to compete with any country in the world in any market of the world. The manufacturer who does not know what his goods cost is generally the fellow who is cutting prices and demoralizing the industry he may be engaged in."

One of the reasons why the German, English, French and other European countries have succeeded in getting the large contracts to furnish the South American countries with most of their electrical material and appliances, is because the Europeans have been engaged in their respective businesses for a number of years; their plants are well organized and they are most thorough in arriving at the actual cost of producing their goods, as well as the cost of selling them. Having this information almost at their fingertips, whenever an order is to be placed in any foreign country they absolutely know what quotations to make and just how far they can go.

The American manufacturer has been busy at home making a substantial profit on a small gross business and has been rather indifferent about increasing it so long as his profits were reasonably large.

"But the day of large percentages of profits on a small gross business is over said Mr. Hurley. To-day competition is more keen and if we want big profits —which I think we all do—we must find

them in big volume, and to get this increase we must go into the forgein markets."

Mr. Hurley said that a powerful foreign trade would create such a wave of prosperity as to tide the country over at a time when it might be visited by domestic depression. In this respect, he said that financial and business depression at present extends throughout Latin America.

Ell C. Bennett, Mercury of the Jovian Order, was present and spoke briefly relative to the need for more members and to the plans for increasing the volume of advertising in the *Jovian*.

Thomas Bibber, W. R. Pinckard and Homer Niesz also were called upon. The meeting was in charge of Morgan Ellis, second tribune.

Plans of National Joint Committee On Line Construction.

For the purpose of completing its organization and laying out its working program the National Joint Committee on Overhead and Underground Line Construction held a meeting at the headquarters of the American Institute of Electrical Engineers on December 16, 1914. According to present plans this Committee will prepare specifications for suggested practices or perhaps recommend modifications of existing regulations relating to the following subjects:

(1) Underground and undergrade crossings.

(2) Crossings of electric wires over electric railway tracks.

(3) Crossings of trolley contact wires.

(4) Overhead crossings of wires or cables of telegraph, telephone, signal and other circuits of similar character over steam-railroad rights of way, track, or lines of wire of the same classes.

(5) Overhead crossings of electric light and power lines.

(6) Parallel lines.

Specifications covering subject No. 4 already prepared by an earlier joint committee representing various interests are now being considered for adoption by the National Joint Committee. Subject No. 5 has been covered by the present standard specifications, the edition adopted and published by the American Electric Railway Engineering Association being the latest revision. The other subjects are new and specifications relating thereto will have to be prepared by the committee which desires to enlist the co-operation of all persons and associations interested in any subject pertaining to line construction, with the object of preventing duplication of work and insuring uniformity in the specifications adopted by the various associations, thereby avoiding all unnecessary conflicts, and it is the desire of the Committee to be looked upon more or less as the court of last resort in the formulation and interpretations of specifications and as such should like to receive the hearty support of all interests concerned.

The National Joint Committee is made up of official delegates and alternates from the following organizations: American Railway Association, American Railway Engineering Association, Railway Signal Association, Association of Railway Telegraph Superintendents, National Electric Light Association, American Electric Railway Engineering Association, American Institute of Electrical Engineers, American Electric Railway Association, American Telephone and Telegraph Company, United States Bureau of Standards, Independent Telephone Association of America, Western Union Telegraph Company, Postal Telegraph Company.

Farley Osgood, Newark, N. J., is chairman, and G. W. Palmer, Jr., Boston, Mass., is vice-chairman of the committee. The secretary is R. D. Coombs, 30 Church Street, New York, N. Y., and W. H. Feller, 759 Broad Street, Newark, N. J., is assistant secretary.

Tax Assessments on Utility Properties Subject to Review in New Jersey.

Establishing a precedent for future taxation of utility properties in New Jersey, the State Court of Errors and Appeals has handed down an important decision in setting aside the assessment for 1911 of $7,385,180 on the property of the Long Dock Company, a subsidiary of the Erie Railroad Company, at Jersey City. The land under discussion embraces about 577 acres, fronting on the Hudson River, and comprising piers, docks, elevators and railroad tracks.

In 1911 tax assessments to the aggregate amount noted were levied by the Board of Assessors, this including an addition of about 20 per cent to the former valuation. In being brought before the Supreme Court, this tribunal sustained the assessment, holding that it would not, in setting the question of fair value, oppose its judgment to that of an administrative board entrusted by law with the duty of fixing such value, and that the State Board of Assessors was a judicial body whose findings could not be reviewed unless the principles upon which their determination was reached was "inherently and legally vicious."

The Court of Errors and Appeals in reversing this view states that the lower court treated the valuation of the State Board of Assessors as if it were the judgment of a judicial tribunal and the Supreme Court a mere appellate tribunal passing upon questions of law only. It declares that under the railroad tax act it is the duty of the Supreme Court to afford relief as well in cases where the amount of tax is excessive or insufficient, as in cases where the principle of law upon which the assessment is made is erroneous or does not hold, and that assessments levied by taxing tribunals are reviewable even if the question at issue is one of fact instead of law. In conclusion the Court says:

"The hearing must be a real, not a sham hearing; the taxpayer has the right to support his allegations, if need be, by proof; to determine whether there is need of proof, he must know what he has to meet; hence, he has the right to know what knowledge the individual members of the State Board of Assessors have upon which to base their valuation, and for that purpose to call the members of the Board as witnesses and cross-examine them as to their individual knowledge of facts, but not as to the method by which the Board reached its results."

This decision by the Court of Errors completely changes the principle that has been observed heretofore by the courts of New Jersey in dealing with appeals in cases of tax assessments of railroads and other utility properties.

Public Utility Regulation Discussed in Pennsylvania.

That the theory and practice of public utility laws and commissions in general and of Pennsylvania in particular, work to the ultimate advantage of both the public and the utility companies, was conclusively shown by Lawrence H. Rupp, district attorney of Lehigh County at the January meeting of the Lehigh Valley Light & Power Company, Section of the National Electric Light Association, held at Allentown, Pa.

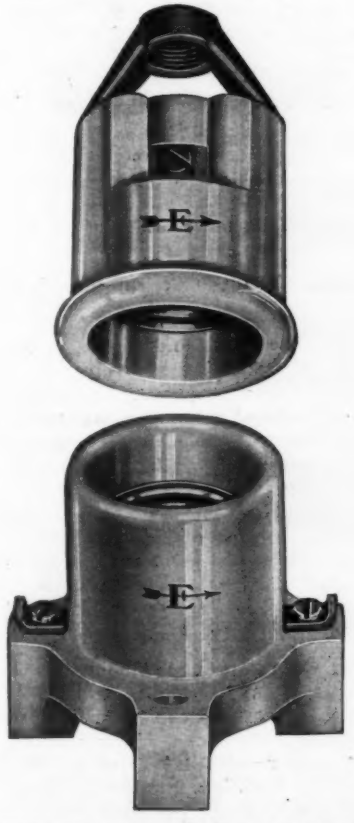
Mr. Rupp is a member of the firm of Butz & Rupp, legal advisors to the Light & Power Company, and is one of the best known lawyers in eastern Pennsylvania. In an admirably clear and simple exposition of the facts, he traced the events leading up to the framing of the Pennsylvania utility law and, taking up the most important points in the act, drew analogies with similar cases in the common law to prove that regulation is purely a matter of the adaptation of the common law to modern conditions. While one or two minor provision in the law as enacted by the Legislature are obviously unworkable for all parties concerned and therefore unfair and unconstitutional, such flaws will undoubtedly be eliminated when they are ultimately brought to the attention of the law-making bodies.

New Electrical and Mechanical Appliances

Arrow Socket and Receptable for Gas-Filled Tungsten Lamps.

A new socket and receptacle for mogul base lamps are shown in the accompanying illustrations. The socket with yoke is of the same over-all length as the brass-shell mogul sockets already on the market and can be used with fixtures already designed for those brass-shell sockets.

The receptacle shown herewith is



Arrow "E" Ventilated Socket and Receptacle for Gas-Filled Lamps.

adapted for exposed wiring and is so designed that the porcelain lugs projecting below the bottom surface of the receptacle allow an air space between the receptacle and the surface to which it is attached. Both of these devices are particularly adapted for use with the new gas-filled high- efficiency tungsten lamps, and are manufactured by the Arrow Electric Company, Hartford, Conn.

Metropolitan Inclosed Service Switch and Meter-Protecting Device.

The demand of modern engineering practice and municipal safety requires all conductors to be inclosed in metallic conduit. Installations so equipped have been found to be a source of real economy. This progress has naturally made necessary the development of modern protected switch and cutout apparatus.

The Metropolitan inclosed service switch has been designed to offer maximum protection against unauthorized interference, obtaining unmetered current, fire hazard, injury or damage due to accidental contact with live parts, interruption of service, etc. It consists of a switch-cutout using standard plug fuses and a sealable metallic box. The switch mechanism is of the double-break plunger type actuated by springs. The fuses and all accessible energy-

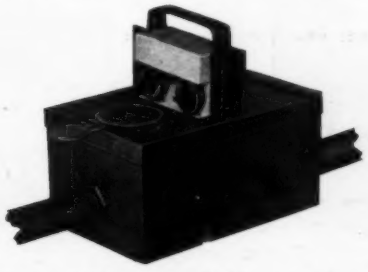


Fig. 1.—Bottom and Side View of Inclosed Service Switch, Open Position.

carrying parts are dead when exposed, and danger of shock when installing fuses is consequently eliminated. The switch mechanism may be sealed in closed or open position or may be left unsealed, so that the consumer can renew the fuses when they become defective or blow out. The box in which this unit is mounted is equipped with interchangeable conduit knockouts at each end and sides, permitting the use of several sizes of conduit.

Fig. 1 shows a 30-ampere, three-pole service switch in open position. The photograph was taken so as to show the under side of the switch where the plug fuses are placed. When the switch is pushed in, these are entirely hid. Suitable openings are provided on the house side of the switch to permit open wiring of the house circuits.

For meter protection provision is made on the end of the switch box to fasten metallic meter adapters, which are made to conform to the different shapes of the various watt-hour meters now on the market. These adapters completely cover and protect all of the conductors around the meter, preventing any method of unauthorized interference or tampering. A combination inclosed service switch and meter-protecting device is shown in Fig. 2. This shows the switch mechanism closed.

Fig. 2.—Combined Service Switch and Meter-Protecting Device.

These switches and protective devices are manufactured by the Metropolitan Engineering Company, 30 East Forty-second Street, New York City.

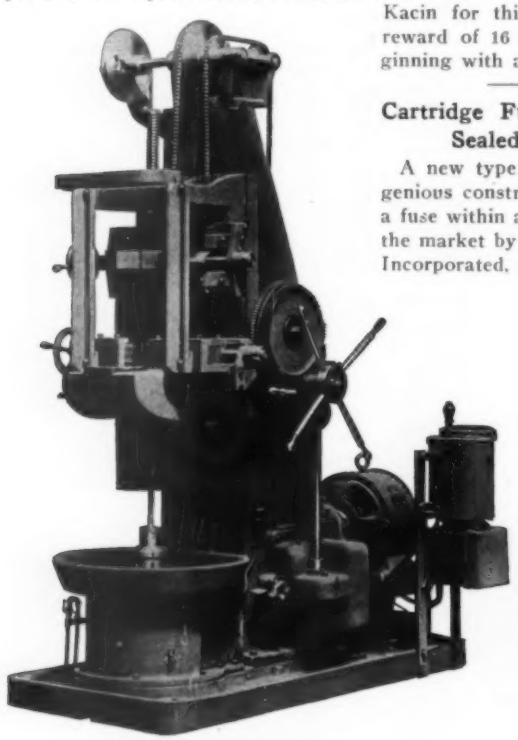
American Telephones in China.

An American company has lately installed a modern central-energy telephone system at Changsha, China. It has an initial capacity of 1,000 local and 30 toll lines.

Motor-Driven Inverted Drill.

The interesting feature of the drill shown in the accompanying illustration is that it drills from the bottom upwards instead of vice versa, which is the usual practice. This machine is designed for drilling billets, 20 inches long and 4 or 5 inches in diameter. The advantage of drilling them in an inverted position is that the driving spindle is held rigid at the bottom of the machine and vibration is reduced to a minimum on the drill, which is of small size and 24 inches long.

The head of the machine is really a jig for holding the pieces, and two sets of jaws are provided to grip the upper and lower parts of the billet and insure centering. There is also a jack-screw for holding the billet in place.



Motor-Driven Inverted Drill.

The machine is manufactured by the Foote-Burt Company, Cleveland, O., and is driven by an 8.5-horsepower Westinghouse direct-current adjustable-speed motor running at 800 to 1,600 revolutions per minute and controlled by a Westinghouse drum controller.

Central Electric Company of Chicago Announces Change in Selling Organization.

Effective January 11, the sales force and selling policy of the Central Electric Company, of Chicago, Ill., will be under the immediate direction and supervision of John R. Olsen, city sales manager, and A. J. Selzer, county sales manager. Mr. Olsen's promotion follows 12 years of service for his company, during which period he has advanced from the billing desk to his present position. Mr. Selzer, formerly Chicago representative for the Adams-Bagnall Electric Company, brings a wide knowledge of the industry and the valuable asset of a host of friends to his new position as county sales manager.

Another well desired promotion, following Central Electric Company's change in policy, is that of B. J. Kacin, who will have charge of industrial sales as special industrial plant representative. The designation of Mr. Kacin for this important post is the reward of 16 years of loyal work, beginning with a job as office boy.

Cartridge Fuse With Renewable Sealed Fuse Element.

A new type of cartridge fuse of ingenious construction that is practically a fuse within a fuse has been placed on the market by the Star Fuse Company, Incorporated, 448 Broome Street, New York City. The illustrations herewith show the construction quite well. The outer shell is a fiber tube threaded at the ends to receive brass end caps. Whether of the ferrule or knife-blade type, these end caps have inner slotted spring clips or contact rings to hold the ends of the renewable fuse element.

The fuse element is itself a cartridge fuse of simple and compact construction. About the fuse wire is a filler of asbestos sheet, surrounding which is a glass tube with brass end caps cemented to it; the fuse wire is soldered to these end caps. The asbestos filler sheet is really in two parts separated by a small gap that acts as an indicator. When the fuse blows this space becomes blackened. The end caps of the element fit snugly into the spring clips of the caps on the outer casing referred to above.

Renewal of the fuse element can be very quickly and easily effected. It is necessary merely to unscrew either outer end cap, pull out and discard the blown inner element, insert a new element, and replace the outer cap. The outer casing and end caps can be used again and again. Considerable economy is thus obtained, since the cost of the new inner element is much less than that of an ordinary non-renewable cartridge fuse. The Star fuses are made up in standard ratings and to standard Code dimensions. They are well designed and sturdily built to meet the severest requirements.

Renewable Fuse Element, 10 Amperes.

Star Renewable Fuse Element, 60 Amperes.

Knife-Blade Fuse With Partial Section of End Cap and Shell to Show Construction.

Star Fuse With End Cap Removed and Element Exposed.

High-Capacity Outdoor Substation Switching and Protective Units.

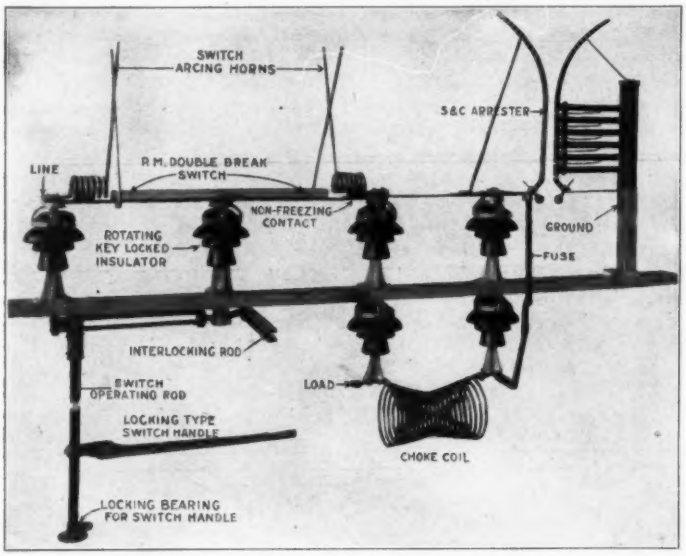
The successful commercial operation of low-cost, medium-capacity, high-tension, outdoor substations has developed a demand for higher-capacity equipment which can be operated without daily attendance. To meet these conditions, the complete switching, fusing and lightning-arrester unit, shown herewith, has been developed. Three of these units mechanically interlocked constitute a three-phase equipment.

The S. & C. lightning arrester employed with these substation units was described in these columns in the issue of January 2, 1915. It consists of two discharge horns, one of which is solid, insulated and adjustable, the other sectionalized and fixed in position. The lower section of the fixed horn is mounted on a steel ground post, an insulating section supporting tubes containing non-inductive resistance. To the outer ends of the insulating tubes and resistances are secured

copper segments of the discharge horn, a small air gap being left between each segment. The resistances are connected in series, the steps being graded in value.

Lightning and static disturbances of high frequency are rapidly discharged across the sphere gap at the bottom. This gap, having no series resistance, furnishes an ideally free discharge path to earth, rapidly draining static charges. Under lightning or abnormal static conditions, the incoming surge breaks across the straight line gap to ground, no resistance being in circuit. If the discharge is followed by line current, the arc rises rapidly, due to the heated gases. As the arc travels upward, passing from segment to segment, it automatically introduces resistance in series with the ground circuit, materially reducing the current flow. This resistance, increasing in value as the arc rises, insures a comparatively small arc, quickly suppressed on the diverging horns. Between the load and the incoming surge is located a powerful, specially formed choke coil, which reflects surges to the arrester.

The above equipment, known as the type "S. R. E.," is being marketed by the Delta-Star Electric Company, Chicago, Ill.



Complete Outdoor Switching and Protective Unit.

Electric Immersion Water-Heater.

A small electric water-heater that heats a glass of water in a minute has been developed and placed on the market by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa. The heating element is imbedded in a cylinder slightly less than an inch in diameter and 4.5 inches long which is surmounted by a metal top large enough to cover the glass vessel and terminates in a switch. The feed wire is introduced through the top. This top serves to keep out dirt and facilitates the heating process. The other parts are a glass vessel for the water and a metal holder.

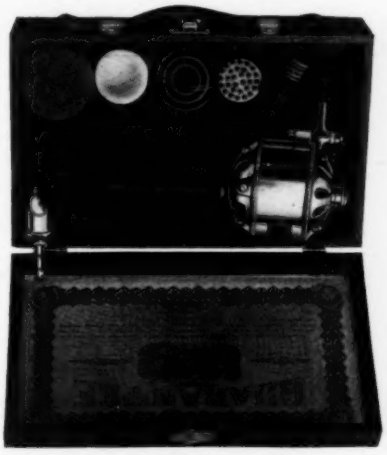
The features are quick heating and quick cooling of the heating element. It will boil water in a minute and a half and the heating element may be removed from the glass as soon as rapid boiling ceases without danger of burning the fingers. The heater serves equally well as a small sterilizer for dentists and for domestic use. The power consumption is 450 watts.

Electric Immersion Water-Heater.

To promote the importation of needed electrical supplies into Spain, a reduction of the tariff thereon is proposed.

New Hamilton-Beach Low-Priced Vibrator.

The Hamilton-Beach Manufacturing Company, Racine, Wis., has placed on the market a guaranteed electrical vibrator to retail for $10. Heretofore, the selling price of a dependable motor-driven massage machine has operated against the more general adoption of vibrators for use in the home, but with the introduction of what the company calls the "New Life Guaranteed Vibrator" (at a trade price of $7.12 and special discounts to jobbers), the health and beauty benefits following the proper use of a good vibrator may now be enjoyed at reasonable cost in most homes wired for electricity.



Hamilton-Beach Vibrator.

The new vibrator is guaranteed against electrical and mechanical defects for one year. Its motor, operating on direct or alternating current, is of the same rugged construction as those employed to drive Hamilton-

Beach drink-mixers, fans, grinders, hair and shoe driers, and other electrically driven industrial, commercial and household appliances. A switch to regulate the speed is located within easy reach of the thumb. Approved portable cord and separable attachment plug are furnished, and the five applicators that come with each vibrator are specially designed to produce the correct stimulating, soothing and beautifying results. The outfit is packed in a durable leatherette-covered box equipped with a snap lock and carrying handle. Free literature for distribution among customers will soon be available and may be had on application to the company.

General Electric Company's Exhibit at the Panama-Pacific International Exposition.

The exhibit of the General Electric Company in the Transportation Building at the Panama-Pacific International Exposition will be very extensive and will comprise electric locomotives for various classes of service, including steam-railroad electrification, railway motors and all kinds of apparatus and accessories for electric railways, signal accessory electric devices, electric apparatus and equipment for railway shops, electric illumination for cars and shops, etc.

GENERAL ELECTRIC CO.
ELECTRIC LOCOMOTIVE BUILT BY GENERAL ELECTRIC CO.
FOR EXHIBIT AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

Shipping Traction Section of General Electric Company's Transportation Exhibit.

One very interesting exhibit will be the electric locomotives, shown in the illustration coupled together ready for shipment across the continent. The Butte, Anaconda & Pacific locomotive is one of four units which have recently been built for this road and is a duplicate of the original 17 units put into service in 1913. These are the first 2,400-volt, direct-current electric locomotives ever built. Each unit weighs 80 tons. Two are, however, coupled together for freight service to form a locomotive weighing 160 tons. The combination freight locomotives are hauling main-line trains of 4,600 tons at a speed of 16 miles per hour against the ruling grade of 0.3 per cent, and at 21 miles per hour on level tangent track. The two passenger locomotives, operating as single units on this system are geared for a maximum speed of 45 miles per hour on level tangent track.

A 60-ton electric locomotive of the type built for interurban freight and passenger service will be on exhibit. This machine is designed for both 600 and 1,200-volt operation. The cab is of all-steel construction and is divided into three sections, the central operating cab containing the controller and other apparatus that should be within immediate reach of the engineer, and the two end steeple-back cabs containing the auxiliary electrical apparatus. The motor equipment consists of four commutating-pole motors, one mounted on each axle. These motors are arranged for forced ventilation from a blower in the cab. The well known type M multiple-unit control is used and combined straight and automatic air brakes are provided. The trucks are the equalized type and conform to MCB standards.

There will also be a 16-ton electric locomotive of similar design with steeple-back end cabs for industrial freight and switching service. It is equipped with two commutating-pole ventilated motors.

Two types of mining electric locomotives will be shown. One is a large 20-ton trolley type equipped with three motors and the other is a 6-ton combination trolley and storage-battery locomotive equipped with two motors all of the commutating-pole type.

The General Electric Company has adopted the commutating-pole ventilated type of motor as standard for practically all multiple-unit railway equipments. Motors of this construction have a greatly increased service capacity when compared with motors of the closed type having the same hourly rating, on account of the positive circulation of air that is maintained throughout the interior by the system of self-ventilation. The display of these motors will embrace 600-volt motors of 35, 40, 50, 65 and 120 horsepower, respectively; 600/1,200-volt motors of 75 and 85 horsepower, respectively; a 2,400-volt motor of 140 horsepower; a 600-volt motor of 60 horsepower exhibited exploded to show the construction.

A storage-battery platform truck and also a battery truck crane for moving freight in warehouses, factories and on docks will be exhibited. There will be a portable air-compressor set for use around factories, the compressor being fitted with a glass cover and the interior illuminated to show the operation. This same type of air compressor is employed with air-brake systems, one of which will be displayed mounted on a rack the same as installed on a car with all valves and accessories for combined straight and automatic operation.

One of the most interesting features of the traction exhibit will be the two single-end type MK control equipments, each mounted on a separate rack in the usual manner of installing for service. The exhibition racks, which occupy a floor space about equal to that for a small city car, will be placed end to end with control jumpers and air-brake hose connections for train operation. Each control equipment consists of a master controller, contactor box, etc., completely wired up for operation of two motors, which are mounted on a truck beneath the rack. The motor trucks are equipped with third-rail shoes.

Another exhibition rack will contain a complete type M multiple-unit control designed for three-speed operation in city service. A complete assortment of line material will be grouped on a large frame, many of the devices in the same manner as installed in actual service.

A large number of separate valves, contactors, governors, fuse boxes, rheostats, switches, lightning arresters and other devices will form part of the exhibit. Forged-steel treated gears and also cast-steel split and solid gears and pressed-steel gear cases for city, suburban and interurban service will be shown, as well as several grades of

forged-steel treated pinions and pinion pullers. A display of railway lamps will demonstrate effectively systems of lighting cars with modern Mazda lamps. Automobile lamps and accessories will also be included, shadow boxes and photometric curves will demonstrate the relative value of the illuminating units. There will likewise be a complete line of both incandescent and luminous-arc headlamps with semaphore lenses and parabolic reflectors for city, suburban and interurban service.

The line of signal accessories will include transformers, vacuum and multigap lightning arresters, motor-generator sets, switchboard instruments, etc. Other interesting apparatus of various kinds will be a mercury-arc rectifier of the standard type for battery charging, an electric-arc welding outfit, a complete line of car fans, a new high-frequency oscillator in operation testing insulators, a full line of insulators, a new multi-recorder for attaching to switchboards to keep automatically a record of the time of the manipulation of the various switches, an 18-inch searchlight projector similar to those used for illuminating the Exposition grounds, complete line of circuit-breakers, etc.

An attractive and instructive feature of the exhibit will be the several hundred illustrations which a stereomotograph will project automatically on a large ground-glass screen. These will cover the range of modern traction developments, made from actual photographs taken in various parts of the country, and will show important applications of recent railway equipment in city, interurban and heavy electrification service, as well as many typical installations of new apparatus in large power plants and substations.

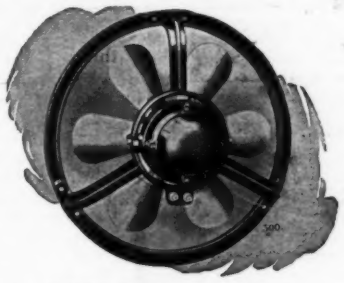
Westinghouse Company Organizes New Department.

Probably in no portion of the field of electrical industry has there been so much progress in the last few years as in that of automobile accessories. The Westinghouse Electric & Manufacturing Company a few years ago began the manufacture of starting, lighting and ignition outfits for gasoline cars, devoting its entire Shadyside works to this line of manufacture.

So extensive has been the growth of this business that the Westinghouse company organized, on January 1, a separate department for the production and sale of automobile accessories to be known as The Automobile Equipment Department, of which G. Brewer Griffin is the manager. Mr. Griffin was formerly manager of the detail and supply department, having active charge of automobile equipment sales, and to his ability is due in no small measure the present high standing of the Westinghouse automobile starting, lighting and ignition systems.

Fully Inclosed Exhaust-Fan Motors for Use in Compressed-Air Spraying Booths.

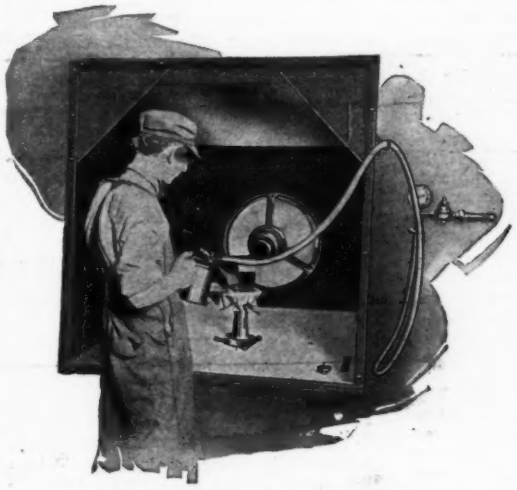
The accompanying illustration is of a new type of fully inclosed exhaust fan in use in a compressed-air spraying



Inclosed Exhaust-Fan Motor.

booth. This fan effectively supplies fresh air and removes from the booth all the vapor and objectionable odors which arise from the spraying materials, which are injurious to the health of the operator of such a machine.

It is especially designed for this class



Exhaust-Fan Motor in Spraying Booth.

of service. The body casting, both front and rear heads, are solid, preventing the spraying materials which are drawn onto the motor by the suction from accumulating on the working parts and affecting the operation of the motor.

This motor can be used for any class of service in which special protection is necessary, that is, where the air is filled with grit, grease, acids or other substances which are injurious to the windings and commutator of a motor.

The outfits are furnished complete with tripod ready to be mounted in booth, or any place where necessary opening is available.

This motor is supplied in two sizes (12 inch and 16 inch) for both direct and alternating current. The 12-inch fan has an air displacement of 1,500 to 2,000 cubic feet per minute while the 16-inch displaces from 2,200 to 3,300 cubic feet of air per minute.

These outfits are being placed on the market by the Robbins & Myers Company, Springfield, O.

Sales Conference of B-R Electric & Telephone Manufacturing Company.

An annual conference of the selling department of the B-R Electric & Telephone Manufacturing Company was held in Kansas City, Mo., Saturday, January 9. Twenty salesmen, five visiting representatives of other firms, and the officers of the company attended. Speeches on salesmanship, as it is related to the business and products of their firms, were made by F. E. Witwer, manager of the Brilliant Electric Lamp Works, of the General Electric Company, of Cleveland; H. M. Merrithew, of the American Ever-Ready Company, Chicago; F. N. Boyer, district manager of the General Electrical Company, St. Louis; W. M. Deming, manager, supply department, General Electric Company, Schenectady; and William M. Hand, district manager, General Electric Company, Kansas City. Francis M. Bernardin, president of the B-R Company, presided at the meeting.

High-Temperature Arc.

A German, Otto Lummer, some time ago described certain experiments which had been carried out with a view to producing exceedingly high temperatures. His method consisted in operating an arc lamp in an atmosphere under an extremely high pressure.

Many experiments were made before a suitable carbon was discovered which was able to preserve its full lighting power for a long period under pressure up to 22 atmospheres. The temperature in the crater of an ordinary arc burning in free air is about 3,600 degrees centigrade; this temperature has been exceeded by more than 3,000 degrees, it is said.

The temperature of the sun is estimated to be only about 6,000 degrees centigrade.

Current Electrical News

ATLANTIC STATES.

LEOMINSTER, MASS.—The board of trade lighting committee, John Kivlan, chairman, is co-operating with the Leominster Electric Light and Power Company to secure improved lighting standards throughout the business sections of the city.

SOUTH HADLEY FALLS, MASS.—At a special town meeting it was voted to raise $40,000 for the purpose of taking over the local electric lighting plant from the Amherst Power Company.

LA SALLE, N. Y.—A municipal light plant is under consideration. Address Frank Plumbtree.

ALLENTOWN, PA.—The Commercial Construction Company, of New York City, has been awarded the contract for the electrical installation (except fixtures) for the $250,000 rear wing of the new Lehigh County Court House here. The Grand Jury has just recommended to the Court that the construction work for the entire building be started as soon as the portion now under way is completed. The entire structure will cost over $1,000,000, and it is practically certain that Judge C. A. Groman and the County Commissioners will follow the suggestion made by the Grand Jury. R. S. Rathbun is supervising engineer in charge of the work.

ALLENTOWN, PA.—The contract for the plans and specifications of the new $30,000 Odd Fellows' Temple to be erected in this city, has been awarded to the architectural firm of Jacoby & Weishample. of Allentown. The building will be up to date in every respect and bids will shortly be asked for the electrical installation.

BANGOR, PA.—As a result of an investigation of the fire hazard involved, the Underwriters' inspectors have suggested that the method of house wiring commonly used in installations here be changed. Among other recommendations is one advising that the main entrance switch be placed within reach to provide for emergency in case of fire. As a result, the majority of the installations will require reconstruction.

BATH, PA.—The municipal officials are considering offers to supply energy for the electrical illumination of the streets here. Representatives of the Lehigh Navigation Electric Company have conferred with councils, but the proposition is being held under advisement pending further inquiry.

MT. WOLF, PA.—The borough council is discussing a proposal to obtain the consent of the voters to a $5,000 bond issue for the purpose of erecting an electric lighting station. C. T. Kinports is president of the borough council.

TOCCOA, GA.—The city is planning to build an electric light plant. Address the mayor.

NORTH CENTRAL STATES.

BUCYRUS, O.—The Bucyrus Electric Light and Power Company is planning to double its present capacity. Plans for the new plant are under way and changes are to be made in the spring when the new installation will be commenced. The capacity of the generators is to be doubled, and plans for rural extensions are to be made. Address A. G. Moser, superintendent.

WINDHAM, O. — The Windham Electric Company, recently incorporated with a capital stock of $10,000, proposes to construct a small electric plant to serve the town. F. A. Eberwine, F. H. Walden and others are interested in the project. L.

DECATUR, ILL.—A petition has been presented to the City Council asking that an ornamental lighting system be installed on West Mason Street from Union Street to Dennis Avenue. C. H. Pierce and 54 other property owners have signed the petition. The matter is to be taken up by the officials at a meeting January 18. Z.

ROCHESTER, ILL.—The Haas Electric Company, of Springfield, Ill., has submitted a 20-year franchise for furnishing electric lights to the village board. A committee was appointed to investigate systems in other towns before action is taken on the Haas franchise. Z.

STREATOR, ILL.—Members of the Commercial Club are investigating lighting systems in nearby cities with a view of arranging for a boulevard lighting system for Streator. Z.

WILMETTE, ILL.—The council is planning to install improved street lighting. Address H. C. Arms, Village Trustee.

SAGINAW, MICH.—The question of issuing $750,000 municipal light and power bonds will be submitted to vote in February. Address City Engineer Eymer.

FARIBAULT, MINN.—H. S. Wherland, of this place, and R. T. Wherland, of Redwood Falls, who recently purchased the local electric light plant, are contemplating improvements on the plant in the near future. X.

HENNING, MINN.—Val Hermann, of St. Cloud, has been granted a franchise by this village to establish an electric lighting system. X.

WINDOM, MINN.—By popular vote the City Council has been authorized to appropriate $25,000 for a new electric lighting system. X.

FORMAN, N. D.—The proposal to put in electric street lights will be voted on at the town election in March. Already electric lights have been installed in practically all the business places. X.

WASHINGTON, MO.—The town of New Haven has a committee appointed to confer with George Mittendorf, electrical engineer, on the installation of an electric light plant. The town of Morrison, Mo., is also planning to install a plant. M.

WINFIELD, KANS.—The water and light commission has been authorized to advertise for bids for engine, generator and auxiliaries capable for producing 500 kilowatts, doubling the present capacity of the plant. The improvements will cost about $15,000. M.

SOUTH CENTRAL STATES.

LOUISVILLE, KY.—The Board of Park Commissioners of Louisville is considering a proposition submitted by the Louisville Gas and Electric Company to supersede the old gas lamps in the city's Western and Southern Parkways and in Cherokee Park with electric lamps. The proposal includes necessary alterations to the present lighting standards and provides for a total of 207 lamps.

CLARKSVILLE, TENN.—The City Council has instructed the City Attorney to proceed toward compelling all companies at once to bury all electric and telephone wires in the central part of the city. The Cumberland Telephone and Telegraph Company has already agreed to co-operate with the authorities in the improvement. G.

TEMPLE, TEX.—The city officials have under consideration the installation of an electric fire-alarm system.

WOLFE CITY, TEX.—The Wolfe City Light Company, which has been organized with a capital stock of $6,000, will construct an electric light and power plant. M. Tasker is interested. D.

WESTERN STATES.

PHOENIX, ARIZ.—The Falls Power and Electric Company, a co-operative concern which is composed of farmers residing northeast of here, has obtained a franchise for the construction of an electric power transmission line from Arizona Falls power plant to supply power to a number of irrigation pumping plants and for other industrial purposes. The plans of the new company have met with strong opposition on the part of the Pacific Gas and Electric Company, whose field it has invaded. D.

TUCSON, ARIZ.—As a result of a recent election, bonds to the amount of $35,000 are to be issued for the installation of an ornamental street lighting system. L. O. Cowan is city clerk.

ENUMCLAW, WASH.—The Puget Sound Traction, Light and Power Company, operating in Seattle, and other Puget Sound cities, maintaining head offices in Seattle, recently secured an option on the local power plant, and has announced its intentions of rehabilitating same, and installing additional machinery, intending to extend the lighting service to Burnett, Wilkeson, Carbonado and other towns in this

section. It is reported active work of reconstructing the plant will begin shortly.

SEATTLE, WASH.—Three thousand acres of land in Skagit County, together with water rights on Baker River, have been purchased by the Puget Sound Traction, Light and Power Company, a subsidiary company of the Stone & Webster Corporation, from the Superior Portland Cement Company, J. C. Eden, president. A first payment of $50,000 has been made. Ultimately millions of dollars will be expended in developing the project, according to Frederick S. Pratt, vice-president of the Stone & Webster Corporation. It is asserted that electrical energy can be developed on this site more cheaply than anywhere else in the state of Washington.

SEATTLE, WASH.—The City Council has passed the bill appropriating $10,000 for the purpose of extending municipal lighting service to Foster, Tuckwila, Riverton, and contiguous territory, over the veto of Mayor Hiram C. Gill, who asserts that he will not allow the extension to be made, stating that if these towns wish to use city light, they must build their own transmission lines to the city limits. The issue is such that a mandamus suit may be necessary. The Council is equally determined to make the extension, as soon as possible.

MADERA, CAL.—It is reported that negotiations are on between the San Joaquin Light and Power Company and the Waterloo, Texas Flat & Baker mine interests for the installation of a power line.

PLUMAS, CAL.—It is expected that the Railroad Commission will allow the issuance of $52,000 in six-per-cent first-mortgage bonds, which will assure the construction of the first unit of a power plant and transmission line by the Plumas Light and Power Company, Edwin E. Cox, president.

RIVERBANK, CAL.—A special meeting of the Riverbank board of trade was held for the purpose of discussing the street lighting system. J. E. Williams, L. N. Enright and others were appointed to solicit funds for the maintenance of the system.

SAN FRANCISCO, CAL.—Van Ness Avenue will be the "great white way" as far as street lighting is concerned, when the new system of lamps ordered by the Supervisors is in operation. Two high-power tungsten lamps on each trolley pole is the order to the Pacific Gas and Electric Company, and there are eight trolley poles in each of the 31 blocks between Market Street and the Bay.

VENTURA, CAL.—The Pacific Light and Power Corporation has been granted a franchise by the Board of Supervisors of Ventura County to furnish light and power to the Simi Valley and Las Posas and Camarillo sections nearly to Saticoy.

PROPOSALS.

CONDUIT AND WIRING SYSTEM.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until January 30, 1915, for a new plumbing system, a new conduit and wiring system and interior lighting fixtures in the United States custom house at St. Louis, Mo. Drawings and specifications may be obtained from the custodian of the building at St. Louis, Mo., or at the office of the Supervising Architect.

HEATING, LIGHTING AND POWER PLANT.—Sealed itemized bids will be received by the board of commissioners of Lucas County, Ohio, January 29, for the performance of all labor and furnishing all materials required in the construction and building complete of a new heating, lighting and power plant at the Lucas County children's home, together with all appurtenances thereunto belonging in accordance with plans, specifications, and estimates for said work on file in the office of the county auditor and at the office of Edward Bayer, engineer, 1530 Nichols Building, Toledo, O. Address Charles J. Sanzenbacher, County Auditor.

CENTRAL HEATING, LIGHTING AND POWER PLANT.—Plans and specifications are now approaching completion for a central heating, lighting and power plant, to be erected in Washington, D. C., under the direction of the office of the Supervising Architect. These plans and specifications will be ready for delivery on or after January 15. Bids may be submitted for the entire work or for any one of the following sections: Power plant building complete, with steel stacks; boilers; generating apparatus; pumping equipment; condensers; coal and ash-handling apparatus; steam and water piping; switching gear; tunnels; substation apparatus, etc. Prospective bidders should immediately submit to this office applications for plans and specifications, stating the portions of the work upon which they desire to bid. If it appears that the applicant is in a position to bid on all of the work in any one of the sections of the project, or upon the entire work, the plans and specifications will be forwarded. No plans or specifications will be furnished subbidders or others not in a position to submit a bid on all of the work comprised in at least one section. The Department will be able to allow only about 15 days for the preparation of estimates. At the time plans and specifications are forwarded to bidders the date for the opening of bids will be stated, and this date will not be extended.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained by writing (mentioning file number) to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or to the nearest of its branches at Boston, New York, Atlanta, Chicago, New Orleans, Seattle and San Francisco.]

NO. 15,010. ELECTRICAL SUPPLIES.—An American consular officer in Europe reports a general market in his district for all kinds of electrical novelties, such as lamps, and general electrical supplies. American firms interested in this opportunity should correspond with the consular officer.

NO. 15,012. ALUMINUM CROSS BARS FOR TROLLEY EQUIPMENT.—An American consular officer in Europe advises that a firm in his district is in the market for aluminum cross bars to be used as wire contacts on trolley poles. The firm wishes to communicate with American manufacturers of trolley equipment. It is explained that the local trolley system uses overhead wires, and on the cars, instead of the single-pole and small-wheel contact, scissor-shaped poles are used, contact with the wire being made by an aluminum bar connecting the extremities of the poles.

NO. 15,041. STREET RAILWAY EQUIPMENT.—An engineer in a foreign country has advised an American consular officer that he desires to confer with American manufacturers of street railway equipment. The engineer expresses the opinion that American firms should get the contract for building the proposed subway, which it is estimated will cost about $40,000,000. The inquirer has indicated a desire to receive general information concerning rolling stock and equipment for street railways, together with literature relating to electric motor power in general. He states that he desires to study the railway proposition thoroughly previous to a proposed trip to America. Correspondence preferred in Russian, otherwise in French or English.

NO. 15,061. MINIATURE AUTOMOBILE AND FLASHLIGHT TUNGSTEN LAMPS.—A firm of wholesale merchants and importers in Canada has informed an American consul that it desires to be put in touch with manufacturers of and dealers in miniature automobile and flashlight tungsten lamps.

NO. 15,076. CARBONS.—An American consular officer in the East Indies reports that a company in a city in his district is in the market for yellow-flame carbons for magazine arc lamps, size 12 inches by 7 millimeters. It is explained that there is a shipment en route which will carry the company until April, 1915; that the company has cabled to an American firm for an immediate supply; that the company desires to form commercial relations for future business.

NO. 15,082. CARBONS.—An American consul in one of the British possessions reports the name and address of an electric light company which will soon be in the market for carbons.

NO. 15,129. COPPER, BRASS, AND PHOSPHOR-BRONZE WIRE.—An American consular officer in the United Kingdom reports that a dealer in his district desires to be put into communication with manufacturers of copper, brass, and phosphor-bronze wire, and any other product of the allied branch of the electrical trade. Reference is given.

NO. 15,140. WIRELESS-TELEGRAPH APPARATUS.—An American consular officer in one of the neutral European countries advises that a firm in his district wishes to communicate with American manufacturers of wireless-telegraph apparatus, which may be used in field service. Catalogs and prices should be sent at once. Correspondence may be in English.

NO. 15,143. ELECTROLYTIC COPPER WIRE.—A merchant in Spain informs an American consul that he wishes to communicate with American manufacturers of electrolytic copper wire. Catalog, prices and samples should be sent immediately. Correspondence should be in Spanish.

NO. 15,144. SEARCHLIGHT CARBONS.—An American consular officer in the East Indies reports that a navigation company in his district is desirous of being placed in communication with manufacturers in the United States of carbons for searchlights. Catalogs, price lists, and full descriptive matter should be sent at once. The firm can furnish satisfactory references. Correspondence may be in English.

NEW INCORPORATIONS.

FLAT ROCK, IND.—The Mutual Electric Company has been incorporated with a capital of $2,500 by R. M. Nadin and others.

NEW YORK, N. Y.—Terminal Electrical Utilities, Incorporated. Capital $1,000. Incorporators are Max M. Kotzen, Henry Amster and Abraham A. Kotzen.

SACRAMENTO, CAL.—The Aerial Electrical Company has been incorporated with a capital stock of $100,000 by J. L. Harvey, J. L. Flanagan, Jim and Abbie Thompson.

MILWAUKEE, WIS.—The A. R. Schmidt Electric Company has been incorporated with a capital of $25,000. The incorporators are A. R. Schmidt, O. J. Reuss and John Beyer.

BRONX, N. Y.—Champion Electric Manufacturing Company, Incorporated. To manufacture electrical devices for automobiles, etc. Capital $50,000. Incorporators: Mauro Lamparelli, Salvatore Scognamillo and Frank Scognamillo.

NEW YORK, N. Y.—Edward F. Caldwell & Company, Incorporated. To manufacture gas and electric fixtures, ornamental metal work, etc. Capital $350,000. Incorporators: Edward T. Caldwell, William Klehr and Leopold Livingston.

NEW BRIGHTON, MINN.—The New Brighton Electric Company has filed articles of incorporation with the secretary of state. The company will manufacture electricity for power purposes, heating and lighting, and will also do a telephone business. Capital $10,000. The incorporators are Fred Jesner, W. M. James, F. M. Searles, James E. Treat and J. W. Zandell.

FINANCIAL NOTES.

The Southern California Edison Company has sold to Harris, Forbes & Company, and E. H. Rollins & Sons, New York City, $518,000 general-mortgage five-per-cent 30-year bonds, dated November 1, 1909. Bonds form part of an authorized issue of $30,000,000 of which $13,360,000 are outstanding. They are being offered at 92.

In the first three months of the war, August, September and October, when the earning power of all classes of corporations was put to a severe test, public-utility companies demonstrated their ability to maintain an average increase in earnings over the corresponding period of the previous year. For the three months net earnings of forty-five gas and electric companies reported to W. P. Bonbright & Company were $7,470,000, compared with $6,820,000 for the corresponding months of 1913. August, 1914, net was $2,280,000 compared with $2,075,000 in 1913, September $2,600,000 compared with $2,320,000 and October $2,690,000 compared with $2,425,000.

Dividends.

	Term.	Rate.	Payable.
Am. Gas & Elec. pf.	Q	1.5%	Feb. 1
Am. Lt. & Trac. pf.	Q	1.5%	Feb. 1
Am. Lt. & Trac. cash	Q	2.5%	Feb. 1
Am. Lt. & Trac. com.	Q	2.5%	Feb. 1
Bklyn. City R. R.	Q	2%	Jan. 15
Mil. Elec. Ry. & Lt. pf.	Q	1.5%	Feb. 1
N. H. Elec. Rys. pf.	S-A	2%	Jan. 30
No. Carolina R. R.	S-A	3.5%	Feb. 1
No. Carolina R. R.	S-A	3.5%	Aug. 2
Omaha Elec. Lt. & Pr. pf.	S-A	$2.50	Feb. 1
Penn. Ltg. pf.	Q	1.5%	Jan. 15
Tampa Elec.	Q	2.5%	Feb. 15
United Rys. & Elec., Balt.	Q	1%	Jan. 15

Reports of Earnings.

PUGET SOUND TRACTION, LIGHT & POWER.

	1914	1913
November gross	$ 686,820	$ 752,983
Net after taxes	284,937	329,503
Surplus after charges	107,179	155,083
Twelve months' gross	8,523,731	8,548,934
Net after taxes	3,497,371	3,558,980
Surplus after charges	1,381,849	1,497,391

COLUMBUS RAILWAY, POWER & LIGHT.

	1914	1913
November gross	$ 261,656	$ 267,661
Net after taxes	111,199	102,639
Surplus after charges	68,615	.....
Balance after preferred dividends	48,270	.....

PERSONAL MENTION.

MR. LEWIS O. BREWSTER has been appointed general manager of the New York Insulated Wire Company, 114 Liberty Street.

MR. B. A. APPLETON, sales engineer of the Hemming Manufacturing Company, with headquarters at suite 1654 Monadnock Block, Chicago, Ill., who has been making a visit to the factory at Garfield, N. J., has returned to the West.

Mr. J. J. STEINHARTER, formerly manager of sales for the Canadian Laco-Phillips Company, Winnipeg, Canada, has been appointed sales manager of the Metalyte Company for the northern and northwestern sections of the United States and of Canada.

MR. O. H. DAVIDSON, for a number of years manager of the electrical department of the Mine & Smelter Supply Company, Denver, Colo., has resigned and will establish the Davidson Electrical & Supply Company, with headquarters in the Ideal Building. The company will handle Wagner motors in addition to a line of standard mining and central-station supplies.

MR. THOMAS B. RHODES, for several years associated with the United Electric Engineering Corporation has accepted a position with the Sangamo Electric Company, of Springfield, Ill. Mr. Rhodes will begin by having charge of the company's business with the various electric light and power syndicates and will be located at the New York office, 50 Church Street.

MR. GUY E. MITCHELL has been appointed manager of the Westfield, Mass., local lighting plant, succeeding Thomas T. Logie, resigned. The latter has been highly successful in the operating of the municipal electric plant, and a recent report of a Boston consulting engineer was of a very complimentary nature. During the past year the plant has been considerably improved by the installation of new machinery, and it is contemplated that there will be some further improvements during the present year.

MR. E. A. SANDERS, manager of the Central Union Telephone Company, Youngstown, O., with MR. J. A. CURL, traffic chief, established an innovation in telephone circles on Tuesday evening, January 5, when the 25 girls of the telephone central station held a reception for 50 girls representing the private exchanges about the city. The visitors were taken on a tour of inspection throughout the telephone building and later on tendered a pleasant vocal and instrumental musical entertainment, followed by progressive card games.

MISS GRACE T. HADLEY, formerly assistant editor of *Popular Electricity and the World's Advance*, has joined the staff of the Society for Electrical Development. Miss Hadley will be in charge of the department, "Electric Service in the Home." While with *Popular Electricity*, Miss Hadley developed a department, "Electrical Interests of Women," dealing with all of the practical applications of electricity in the home; but Miss Hadley's work has not been confined entirely to the heating devices. While associate editor of *Electric St. Louis Magazine* she wrote regarding commercial installations.

MR. THOMAS F. KELLY, sales manager of the Dayton Power & Light Company, Dayton, O., was the subject of of a very interesting full-page sketch in the Christmas number of the Dayton (Ohio) *Journal*. Mr. Kelly was chairman of the Community Christmas Committee of the Greater Dayton Association which had charge of the celebration on Christmas Eve at Library Park at Dayton's municipal Christmas tree. Mr. Kelly conceived the idea of Dayton having a permanent Christmas tree, and at his suggestion the Dayton Power & Light Company presented to the city a Norway spruce, which was transplanted to Library Park on December 19.

MR. HARRY G. D. NUTTING has been appointed manager of the engineering department of John E. DeWolf Company, investment bankers, Milwaukee, Wis. Mr. Nutting will assist the buying department in the investigation of the public utility issues and will also have general charge of the public utility properties controlled by the company. Mr. Nutting's office will be with that of John E. DeWolf Company, in the Railway Exchange Building, Milwaukee. He will also continue to devote his attention to his private practice as consulting engineer on public utility problems. Mr. Nutting was formerly an engineer for the Wisconsin Railroad Commission, has managed a number of municipally and privately owned properties, and was recently assistant to the president of the Wisconsin Public Service Company, Wisconsin Railway, Light and Power Company and the Evanston (Ill.) Railway Company.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Jan. 11.	Jan. 4.
American Tel. & Tel. (New York)	118½	116¼
Commonwealth Edison (Chicago)	136	134
Edison Electric Illuminating (Boston)	250	250
Electric Storage Battery Common (Philadelphia)	48½	47½
Electric Storage Battery preferred (Philadelphia)	48½	47½
General Electric (New York)	143	139
Kings County Electric (New York)	120	120
Massachusetts Electric common (Boston)	8	—
Massachusetts Electric preferred (Boston)	—	50
National Carbon common (Chicago)	119¾	116
National Carbon preferred (Chicago)	121	120¼
New England Telephone (Boston)	133	129¾
Philadelphia Electric (Philadelphia)	23⅞	23¾
Postal Telegraph and Cables common (New York)	72	70
Postal Telegraph and Cables preferred (New York)	—	67
Western Union (New York)	59⅝	57⅝
Westinghouse common (New York)	71¾	67½
Westinghouse preferred (New York)	117	—

MR. G. BREWER GRIFFIN, formerly of the detail and supply department of the Westinghouse Electric & Manufacturing Company, has been placed in charge of the newly organized automobile-equipment sales department. Mr. Griffin started in the electrical business in 1889 with the Thomson-Houston Electric Company, at Lynn, Mass., with which company he remained until 1894 when he became associated with the Narragansett Electric Company, at Providence, R. I. While with this company he entirely rebuilt and rearranged its distributing system. In 1896 he went to Elmira, N. Y., and became manager of the jobbing and contracting department of the Municipal Improvement Company, which was engaged in a general construction supply business in connection with the water, street railway, gas and electric light plants. In 1900 Mr. Griffin went with the Manhattan General Construction Company of New York as special representative, opening an office in New England one year later which position he held until the company was absorbed by the Westinghouse Electric & Manufacturing Company, to whose Boston office he was assigned. In 1902 he went to East Pittsburgh as assistant manager of the detail and supply department, succeeding to the position of manager in 1909, which place he held until now.

G. Brewer Griffin.

MR. H. W. COPE, formerly assistant manager of the industrial and power department, of the Westingohuse Electric & Manufacturing Company, at East Pittsburgh, has been appointed director of the company's exhibit at the Panama-Pacific International Exposition, and is now located in San Francisco, giving his personal attention to the work. Mr. Cope was born in North Vernon, Ind., and is a graduate of Purdue University, of that State. Prior to his attending the University he was engaged in electrical construction and sales work. In September, 1898, following his graduation, he became associated with the Westinghouse Electric & Manufacturing Company, at East Pittsburgh, with which company he has remained ever since. Mr. Cope took the apprenticeship course and was engaged in the engineering department in connection with the design of alternating-current switchboards, layout of power houses and substations, and in 1905, was made the head of the alternating-current correspondence department. A short time after this he was made assistant manager of the industrial and power department.

MR. JOHN J. GIBSON, formerly district manager for the Westinghouse Electric & Manufacturing Company, at Philadelphia, has been appointed manager of the detail and supply department. Mr. Gibson was born in

H. W. Cope.

York, Pa., and after attending the Collegiate Institute at that place, entered Lehigh University, at Bethlehem, Pa., from which he graduated in 1895 with the degree of electrical engineer. After graduation he entered the employ of the Westinghouse Electric & Manufacturing Company at its old Garrison Alley plant, Pittsburgh, where he was engaged in work on meters, arc lamps, and switchboards. From 1896 to 1900 Mr. Gibson was employed by the American Telephone & Telegraph Company as inspector and later as district manager at Norfolk, Va. In 1900 he reentered the employ of the Westinghouse Company as chief correspondent of the Chicago office, and later as salesman in the same office. Mr. Gibson was transferred in 1905 to the Philadelphia sales office in which capacity he remained until his appointment as district manager in 1906.

John J. Gibson.

MR. CHARLES L. BENJAMIN, for the past eight years advertising manager of the Cutler-Hammer Manufacturing Company, and one of the best known advertising men in the middle west, has acquired an interest in the Klau-Van Peitersom-Dunlap, Incorporated, Advertising Agency, and will have an active part in the work of the organization. When George P. Rowell founded *Printers' Ink* in 1888, he selected Mr. Benjamin to edit the paper. Mr. Benjamin's success as editor of *Printers' Ink* attracted the attention of many publishers and led to the Century Company placing him in charge of its general publicity work. Here Mr. Benjamin came in contact with and had the benefit of criticism and advice of the late Richard Watson Gilder, the famous editor of *Century Magazine*, the art editors of the magazine, and the late Theodore L. DeVinne, who has been called the greatest American printer. When the Spanish war broke out in 1898 Mr. Benjamin was conducting an advertising service of his own in Brooklyn. He served with Troop C of Brooklyn in the Porto Rican campaign, immediately after the war going to Cuba in the Government service, and when the American troops were withdrawn from the island several years later he was retained by the Cuban Government to supervise the instruction of the new Cuban employees. At the conclusion of this service he returned to New York, going into active advertising work and becoming associated with the publicity department of the Central Railroad of New Jersey and later as editor of the *Suburbanite*, a monthly magazine which achieved remarkable results in stimulating migration from the crowded apartment houses of New York to the pleasant suburban towns along the line of the Jersey Central Railroad. Early in 1906 Mr. Benjamin accepted the call to take charge of the advertising department of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. His work with this organization has again attracted widespread notice and his department has been considered one of the most successful of the publicity organizations connected with modern manufacturing. Mr. Benjamin has been a consistent contributor to the business literature of the day and is a platform speaker of great ability and remarkable magnetic influence and inspiration. He is a past president of the Advertisers Club of Milwaukee and is undoubtedly one of the best equipped all-around exponents of high grade advertising in the country today. His association with the well known Milwaukee agency will prove a tower of strength to that organization, and will enable Mr. Benjamin to exert his influences in a wider field than heretofore.

Charles L. Benjamin.

MR. WILLIAM B. JACKSON, member of the firm of D. C. & William B. Jackson, consulting engineers, has been elected president of the Western Society of Engineers, whose headquarters are at Chicago. Mr. Jackson has had a very extended experience in many lines of engineering work. He is a graduate of the Pennsylvania State College, at which he completed a course in mechanical engineering in 1890. After several years spent in Colorado he took charge of the Pennsylvania mining exhibit at the World's Columbian Exposition, in Chicago, in 1893. The following year he was inspector for the United Electric Light & Power Company, New York City, and later accepted a position in the shops and testing department of the Stanley Electric Manufacturing Company. In 1895 he came to Chicago as engineer of the installation department of the company and had to do with the erection and operation of a number of important water-power and high-tension-transmission plants. In 1899 he became associated with the Colorado Electric Power Company as general superintendent and chief engineer. Reentering the employ of the Stanley Electric Manufacturing Company in 1901, he became its traveling engineer and designed and erected a number of important plants. In 1902, in conjunction with his brother, Prof. Dugald C. Jackson, he entered the consulting engineering business under the firm name of D. C. & William B. Jackson, to which he has devoted his entire time since. The firm had its headquarters at Madison, Wis., until 1907, when the main office was established in Chicago and shortly after this a second office was opened in Boston, Mass.

OBITUARY.

MR. H. HOWARD STANNARD, for the past nine years associated with G. M. Gest, New York, died on Tuesday, December 24.

MR. JOHN HENRY CLARK, for many years connected with the power and mining sales department of the General Electric Company, at Schenectady, N. Y., died at his home in that city Sunday, January 3, after a short illness. He was born in Cornwall, England, in 1859. He had lived in Schenectady since 1895, coming from Boston where he was connected with the General Electric Company's office in that city. He served his apprenticeship with the Whittier Machine Company of Boston and was later its superintendent. For a time he was associated with Oliver Ames, former governor of Massachusetts, in the development of an oil engine. He became connected with the Thomson-Houston Motor Company in 1890, and served until it was merged with the General Electric Company a few years later. His wife, Mary Towson Clark, three children, John Robert, Harriet Anne and Mrs. William W. Miller of Schenectady survive him. There are also several brothers and sisters. He was a member of the American Society of Mechanical Engineers, the Boston Engineer's Club and the Engineer's Club of New York.

DATES AHEAD.

Electrical Contractors' Association of Wisconsin. Annual meeting, Hotel Wisconsin, Milwaukee, January 18-20. Secretary, Albert Petermann, 626 Lloyd Street, Milwaukee, Wis.

Independent Telephone Association of America. Annual convention, Hotel Radisson, Minneapolis, Minn., January 19-21. Secretary, W. S. Vivian, 19 South La Salle Street, Chicago, Ill.

American Wood Preservers' Association. Annual convention, Congress Hotel, Chicago, Ill., January 19-21. Secretary, F. J. Angier, Baltimore, Md.

Wisconsin Electrical Association. Annual convention and joint meeting with Wisconsin Gas Association, Hotel Pfister, Milwaukee, January 20-22. Secretary, George Allison, First National Bank Building, Milwaukee, Wis.

Society of Efficiency. Annual meeting, New York City, January 24-25. Secretary, P. W. Walker, 41 Park Row, New York, N. Y.

Northern White Cedar Association. Nineteenth annual meeting, Minneapolis, Minn., January 26-27. Secretary, N. E. Boucher, Minneapolis.

Western Association of Electrical Inspectors. Annual meeting, Hotel Radisson, Minneapolis, Minn., January 26-28. Secretary, W. S. Boyd, 175 West Jackson Boulevard, Chicago, Ill.

National Convention of Builders' Exchanges. Columbus, O., January 26-28. Secretary, J. M. Vollmer, Louisville, Ky.

National Independent Telephone Association. Eighteenth annual convention, La Salle Hotel, Chicago, Ill., February 3-5. Secretary, F. B. MacKinnon, Topeka, Kans.

"Made in the U. S. A." Industrial Exposition. Grand Central Palace, New York City, March 6-13. President, H. A. Cochrane, Fifth Avenue Building, New York, N. Y.

New England Section, National Electric Light Association. Question Box Convention, City Club, Boston, Mass., March 9-10. Secretary, Miss O. A. Bursiel, Boston, Mass.

With the Electrical Manufacturers

Minerallac Electric Company, Hoyne Avenue and Van Buren Street, Chicago, Ill., announces its purchase of the business, patents and equipment of the **Altman Company** of Chicago, manufacturer of desk push-button outfits. The Minerallac Company will continue the manufacture of the present well known line of Altman equipments, with the addition of a number of new designs.

Steel City Electric Company, 1207-1219 Columbus Avenue, Pittsburgh, Pa., has issued several new publications of which bulletin No. 25 deals with Superior fish wire, bulletin No. 26 is devoted to Star fixture stems and beam straps, bulletin No. 27 lists Steel City outlet boxes for concrete work, and bulletin No. 28 describes conduit bushing adapters and Hickey fixture hangers. Each of the bulletins is illustrated.

Kerr Turbine Company, Wellsville, N. Y., has moved its New York City office to another section of the Singer Building and placed in charge thereof Benjamin G. Fernald, who will act as district manager. Mr. Fernald has had extended experience with steam turbines and has thorough knowledge of the various methods of their application in the production of power under all commercial conditions.

Delta-Star Electric Company, Chicago, Ill., is distributing bulletin No. 15, devoted to high-tension indoor equipment. This bulletin, which comprises 80 pages, has a total of 188 illustrations, and lists approximately 1,200 different types of switches, fuse mountings, choke coils, etc. Ten pages are devoted to technical data of interest to engineers, who can secure copy of this publication upon application.

James Clark, Jr., Electric Company, Louisville, Ky., has issued catalog No. 24 covering its extensive line of Willey electrically driven tools, motors and dynamos. The catalog comprises 44 pages and has nearly 50 illustrations of Willey portable, semi-portable and stationary electric tools and accessories. Among the tools listed are many types of drills and grinders, also a hack saw, notching press, winding machine, turntable equipment, motor-generator, etc.

The P R Manufacturing Company, 629 Bellevue Avenue, Detroit, Mich., is distributing a mailing folder introducing a new line of large "Eclipse" electric battery bells. This bell is from 5 to 12 inches in diameter, with a pressed-steel base. It has an adjustable double-screw contact, an adjustable armature with locked screw adjustment, and the covers are so made and assembled that the movement is protected from dust, dirt and injury.

The Trumbull Electric Manufacturing Company, Plainville, Conn., announces the opening of its San Francisco office at 595 Mission Street, San Francisco, Cal. This office will be in charge of W. P. Naser, for several years western representative of the company, who is thoroughly familiar with the needs and the spirit of the West. A large line of Circle T material will be carried in stock and all ordinary requirements of the trade on the Coast can be taken care of very promptly.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., had added to its publications bulletin No. 1091, which describes the type OB-4 governor for the automatic regulation of pressure for air-compressor and air-brake equipments. This is made for controlling direct-current and alternating-current motors. Recent additions to the company's repair-part catalog are Nos. 1903

and 1904. These deal with types OB and OB-2 and types OB-3 and OB-4 governors for compressed-air equipments.

Sangamo Electric Company, Springfield, Ill., has issued bulletin No. 40, dealing with alternating-current watthour meters. These are built both in single-phase and polyphase types, without and with current and potential transformers. These meters are of the new type H, which is similar in principle to the older induction meters, but has many improved features. All these are pointed out in the bulletin, which has over 30 illustrations of the meters, parts thereof, connecting and dimension diagrams, etc.

Reynolds Electric Flasher Manufacturing Company, Chicago and New York, has entered the ranks of full-fledged motor manufacturers. A line of small single-phase induction motors that it has recently placed on the market is described in bulletin No. 201. These machines range from one-twentieth to one-sixth horsepower in size and 25, 40 and 60 cycles in frequency; 110 and 220-volt motors are made. All the machines are well constructed and of high efficiency. The company is also announcing specially attractive prices on the Reco time switches of the one-day type on account of discontinuing this particular line. These switches are of double-pole knife type and are arranged for either opening or closing circuits for electric signs, show-window lights, store or hallway lights, street lamps, etc.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., had an interesting exhibit at the New York Automobile Show which opened January 2. The principal device shown was the electric gear shift for gasoline automobiles, which was mounted on a Winton transmission. The operation of this device, which eliminates the hand shifting of gears, is controlled by push buttons mounted in the center of the steering wheel. The "Winton Six" is one of the 1915 cars to be furnished with electric gear shift. C-H single-button push-and-pull automobile lighting switches were shown in various combinations for the control and dimming of automobile lights. Pyroplax fireproof insulating material was also shown and samples of such parts as radiator caps, switch sub-bases, fuse boxes, motor terminal blocks, etc., were mounted on a display board. A similar exhibit will be made at the coming Chicago Automobile Show.

Record of Electrical Patents.

Issued by the United States Patent Office, January 5, 1915.

1,123,225. Electric Resistance Device and Means for Regulating the Same. G. E. Bernecker, assigner to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Flatiron element with double coil wound zigzag through insulating base.

1,123,248. Transformer for Use with Current Rectifying Apparatus. F. Conrad, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Duplex autotransformer with mercury-arc rectifier connected between middle and end points.

1,123,251. Electric Regulation. J. L. Creveling, New York, N. Y., assignor to Safety Car Heating & Lighting Co. Regulator for car-lighting set with axle-driven generator and storage battery.

1,123,255. Circuit-Interrupter. H. P. Davis and C. Aalborg, assignors to Westinghouse Electric & Mfg. Co. Oil circuit-breaker opened when cover is raised.

1,123,256. Winding Machine. R. D. De Wolf, assignor to Westinghouse Electric & Mfg. Co. For wire and wire filaments.

1,123,264. Safety Device for Marine Engines. G. C. Ellerton, U. S. Navy. Electric engine-room telegraph with alarm bell to indicate when signal is incorrectly executed.

1,123,267. Gathering Locomotive with Haulage Mechanism. D. T. Fisher, assignor to Jeffrey Mfg. Co., Columbus, O. Electric mining locomotive with reel for cable that can be used as electric supply cable or for haulage.

1,123,275. Regulating Switch for Storage Batteries. J. H. Gugler and M. Lindem, Milwaukee, Wis.; said Lindem assignor to said Gugler. Radial type end-cell switch.

1,123,277. Thermostatic Regulating Device. E. Haagn, assignor to firm of W. C. Heraeus, G. M. B. H., Hanau-on-the-Main, Germany. Rocking circuit-closer.

1,123,282. Circuit Interrupter. F. W. Harris, assignor to Westinghouse Electric & Mfg. Co. Relates to lever mechanism of circuit-breaker.

1,123,283. System of Electric Distribution and Circuit Control. F. W. Harris, assignor to Westinghouse Electric & Mfg. Co. Drum-type controller with interlock.

1,123,288. Automatic Circuit-Breaker. R. E. Hellmund, assignor to Westinghouse Electric & Mfg. Co. The series magnet has S-shaped rotatable armature acting on latch. (See cut.)

1,123,299. Process of Electrolytic Deposition of Metals from Solutions. N. V. Hybinette, Christiania, Norway. Provides circulation of electrolyte through anode chamber to prevent deposition from ferric salts present.

1,123,305. High-Speed Railway. T. L. Johnson, Cleveland, O.; M. J. Johnson, administratrix of said T. L. Johnson, deceased. The track has a series of electromagnets and the car has reversing electromagnets, propulsion following from interaction of the two magnet sets.

1,123,306. High-Speed Railway. T. L. Johnson; M. J. Johnson, administratrix. Magnets are arranged to give an upward pull to the car simultaneously with its forward movement.

1,123,307. Synchronous Rectifier. C. H. Kicklighter, Newberry, S. C. Synchronous motor drives commutating rectifier changing three-phase into direct current.

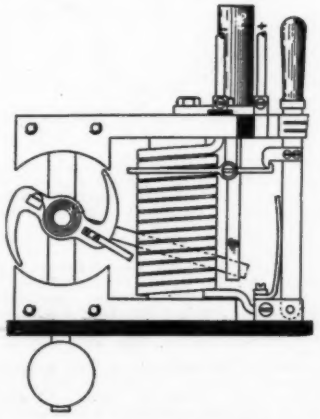
1,123,308 and 1,123,309. Method of Electric Welding. C. H. Kicklighter, Atlanta, Ga. Grooves are cut in the abbutting surfaces, wires put into the grooves and current and pressure applied.

1,123,313. Sign. G. J. Kliebenstein and D. F. Arnold, Marshalltown, Iowa; said Arnold assignor to said Kliebenstein. Electrically lighted disk sign.

1,123,319. Dynamo-Electric Machine. F. R. Kunkel, assignor to Westinghouse Electric & Mfg. Co. Vertical motor for ceiling fan.

1,123,321. Method of Operating Polyphase Induction Motors. B. G. Lamme, assignor to Westinghouse Electric & Mfg. Co. Consists in connecting the sections of each phase in series and then in parallel.

1,123,339. Telephone Exchange System. T. G. Martin, assignor to First Trust & Savings Bank, Chicago, Ill. Automatic party-line system.



1,123,268.—Circuit-Breaker.

1,123,340. Telephone Exchange System. F. R. McBerty, assignor to Western Electric Co. Test equipment for automatic telephone system.

1,123,341. Electrical Control System. W. N. McComb, New York, N. Y. Includes a thermal switch and two electromagnetic circuit-closers.

1,123,342. Insulator Support. O. P. Megahan, Westerville, O. Sheet-metal cross-arm formed as an inverted trough.

1,123,343. Electromagnetic Rail Brake. G. Mertens, Dresden, Germany. Comprises a number of poles separated by air gaps disposed obliquely to the braking direction.

1,123,370. Voltaic Body Battery. A. A. Pratt, Los Angeles, Cal. Set into an insulating disk are concentric rings of several metals.

1,123,373. Electric Circuit Controller. F. Ptok, assignor to Allgemeine Publikations-Gesellschaft M. B. H., Munich, Germany. Motor-driven disk carries contacts engaging stationary circuit terminals.

1,123,380. Radiator. F. T. Riley, Kansas City, Mo. Includes electric heater, water chamber and thermostat.

1,123,381. Telewriter Apparatus. F. Ritchie, Acton, England. Oscillating paper-shifter operated by electric motor.

1,123,384. Incandescent Electric Lamp. J. J. Rooney, New York, N. Y. Relates to switch for double-filament or high-low lamp.

1,123,389. Electric Fixture. L. Schepmoes, assignor to Safety Car Heating & Lighting Co. Corner lamp with diffusing bowl and switch.

1,123,393. Burglar Alarm. J. A. G. Schmiedeberg, assignor to O. J. F. Urban, Hamburg, Germany. Battery, bell and contact-maker all inclosed in a box.

1,123,407. Berth Lamp. J. A. Shaw, assignor to Safety Car Heating & Lighting Co. Has hinged cover with translucent glass over lamp bulb.

1,123,411. Electromagnetic Power Device. A. K. T. Smith and P. Good, London, England. Has reciprocating coil about central core.

1,123,413. Electric Switch. J. C. Smith, Louisville, Ky. Spring contact-maker.

1,123,436. Operating Mechanism for Oscillatory Ignition Machines. R. Wagner, assignor to firm of Robert Bosch, Stuttgart, Germany. For oscillatory magneto.

1,123,448. Ignition System. P. R. Werner, Philadelphia, Pa. Distributer.

1,123,452. Electromagnetic Switching System. L. L. White, assignor to Platinum Electric Incubator Co., Dorris, Cal. Relay controlled.

1,123,454. Rear End Signal for Vehicles. G. J. Wohltmann, New York, N. Y. Includes electric lamps.

1,123,476. Telephone System. O. Brisbois, Chicago, Ill., assignor of one-half to W. Lorimer, Jr. Selector mechanism for party-line automatic system.

1,123,484. Controller for Electric Circuits. C. H. Carter, Colon, Panama. Ratchet-operated pull switch.

1,123,491. Power Conversion Plant. E. A. Corbin, Philadelphia, Pa. Operated by water current and includes a hollow feed cone, water turbine and generator, the latter being completely inclosed.

1,123,493. Elevator. J. T. Cowley, assignor to Lamson Co., Newark, N. J. Automatic dumb waiter.

1,123,506. Telephone Exchange Apparatus and System. J. Erickson, assignor to First Trust & Savings Bank, Chicago, Ill. Automatic system with selectors, etc.

1,123,520. Electric Laundry Iron. M. K. Golden, assignor to Golden Mfg. Co., Detroit, Mich. Fused sand surrounds element and granulated sand fills rest of body.

1,123,523. Electrically Controlled Blowing Head for Glass-Blowing Machines. O. A. Hanford, assignor to Empire Machine Co., Portland, Me. Has electromagnetic chuck.

1,123,543. Electric Current Collector. T. B. G. Janssen, Münster, Germany. For use in electric lighting of cycles and motor cars.

1,123,551. Overhead Trolley Apparatus.

W. H. Kempton, assignor to Ohio Brass Co., Mansfield, O. Frog.

1,123,558. Electric Welding Apparatus. L. S. Lachman, assignor to Universal Electric Welding Co., New York, N. Y. Has several sets of co-operating electrodes for spot welding with electromagnetic control for each.

1,123,599. Machine for Manufacturing Welded Wire Chains. M. B. Ryan, Bridgeport, Conn. For forming and electrically welding the links.

1,123,602. Electric Locomotive. F. L. Sessions, assignor to Jeffrey Mfg. Co., Columbus, O. Has two reels for winding up the electric supply cable.

1,123,614. Automatic Fire-Alarm. A. L. Stewart, L. O. Hawkins and A. E. Mosher, Madera, Pa. Burning of an inflammable strip permits closing of circuit.

1,123,621. Electric Ignition System. J. A. Struthers, Jersey City, N. J., assignor to Tri-Unit Electrical Co. Connected with electric starting and lighting set.

1,123,624. Method of Electric Seam-Welding. E. Thomson, assignor to Thomson Electric Welding Co., Lynn, Mass. Several points in the seam are simultaneously clamped and then spot-welded.

1,123,625. Glower for Electrical Incandescent Lamps. O. M. Thowless, Newark, N. J. The filaments are heated to a high temperature in an atmosphere of hexachloride tungsten and dry hydrogen gas, thus decomposing the mixed vapors and depositing a coating of tungsten on the filaments.

1,123,626. Electrical System of Distribution. W. A. Turbayne, Lancaster, N. Y., assignor to Gould Storage Battery Co. Storage battery with counter E. M. F. booster.

1,123,629. Drip-Pan Alarm. G. R. Waid, Pegram, Idaho. Electric alarm controlled by float.

1,123,631. Sparking Plug. T. M. Wayman and G. T. Wayman, Pittsburgh, Pa. Make-and-break type.

1,123,639. Electrical Massage Instrument. N. Wise, New York, N. Y. Core of solenoid delivers rapidly repeated blows upon applicator spindle.

1,123,654. Telephone Receiver Attachment. G. J. Arfsten, Denver, Colo. Sanitary pad with central opening.

1,123,668. Electric Cable Hanger. M. Blumenthal, Brooklyn, and B. S. Barnard, New York, N. Y. Trough-shaped with flanged ends.

1,123,677. Limiter and Interrupter for Alternating Electric Currents. A. W. Burke, Wilkinsburg, Pa. Transformer with normally short-circuited secondary and interrupter to open the short-circuit when working current is heavy.

1,123,683. Process for Extracting Metals from Living Bodies. T. M. Clague, Newcastle-upon-Tyne, England. Circuit terminals are electrolytic vessels into which the extremities of the body are immersed.

1,123,688. Indirect Illuminating Lamp. H. S. Conant, Baltimore, Md. Above the main reflector bowl is an inverted reflector dome. (See cut.)

1,123,693. Method of Making Alkali-Silico-Aluminate. A. H. Cowles, assignor to Electric Smelting & Aluminum Co., Sewaren, N. J. The material is subjected to action of electrified vapors of salt, water and combustion furnace gases.

1,123,695 and 1,123,696. Multiple Brush Selector. E. B. Craft and J. N. Reynolds, assignors to Western Electric Co. For automatic telephone switch.

1,123,703. Carbon-Assorting Device. A. M. de Jeu, Cleveland, O. Endless carrier with means for discarding bent carbons.

1,123,706. Multiple Brush Selector. A. F. Dixon, assignor to Western Electric Co. For automatic telephone switch.

1,123,734. Telephone Call Recorder. J. K. Guthrie, Perth Road, Ont., Canada, assignor of one-half to J. B. Henniger. For attachment to desk telephone.

1,123,756. Electric Accumulator. H. A. Kinney, Lansing, Mich. Relates to cover and connecting straps.

1,123,758. Electric Switch. O. M. Knoblock, South Bend, Ind. Has sliding contact plunger.

1,123,779. Circular Knitting Machine. K. Moller, assignor to Jenckes Knitting Machine Co., Pawtucket, R. I. An electric motor is controlled so as to rotate or reciprocate the knitting head.

1,123,789. Electric Heating Element. R. J. M. Parke and E. D. Brand, Toronto, Ont., Canada. Resistance coiled through the notches in a metal spider.

1,123,799. Multiple-Brush Selector. J. N. Reynolds, assignor to Western Electric Co. Automatic telephone panel switch.

1,123,809. Circuit Breaker Tripping Apparatus. W. M. Scott, Radnor, Pa. Polyphase breaker.

1,123,818. Electric Bell. F. S. Tucker, Boston, Mass., assignor of one-half to E. P. Severance. Mechanism within gong.

1,123,826. Telephone System. H. G. Webster, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Includes traveling line switch to select an idle link circuit.

1,123,829. Circuit Switch. J. C. Wrasse, Mishawaka, Ind. Solenoid-operated oil switch.

1,123,843. Depolarizer for Galvanic Cells. P. Burger, Berlin, Germany. A mixture of manganese dioxide and finely divided, chemically pure carbon in the form of acetylene soot.

1,123,855. Electromagnetic Measuring Instrument. W. J. Davis, assignor to Edison & Swan United Electric Light Co., Ltd., London, England. Magnetic-vane instrument.

1,123,857. Transmission-Gear-Shifting Device. G. De Witt, assignor of one-third to L. R. Munger and one-third to S. I. Munger, Jr., Dallas, Tex. Electric gear-shifter.

1,123,870. Switch. B. Haskins, assignor to Allis-Chalmers Mfg. Co. Double-throw switch with compressible contacts.

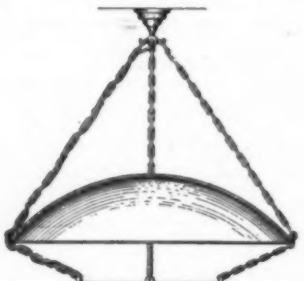
1,123,895. Time Lock Indicator. R. P. Knoebel, Jr., North Bergen, N. J. Includes electric alarm and recorder.

1,123,908. Motor Controlling Device for Taxicabs and the Like. W. L. Majors, St. Louis, Mo., assignor of one-half to A. M. Turnbo. Includes electric signal.

1,123,909. Telephone Sheath. O. W. Messimer, assignor to White Knight Co., New York, N. Y. Leather sheath for desk set.

1,123,918. Interference Preventer for Use in Wireless Telegraph Systems. T. B. Miller and A. H. Cox, assignors of one-half to Smith Cannery Machines Co., Seattle, Wash. Shunt around the rectifying detector includes a resistance adapted to cut down weak electric waves and to break down so as to permit the passage of strong waves.

1,123,925. Traffic Guide. R. W. Roderick,



1,123,688.—Indirect Fixture.

Akron, O. Traffic-directing signs at street intersections are electrically lighted.

1,123,926. Electrical Switch-Throwing Mechanism. J. A. Ross, Altoona, Pa., assignor of one-half to E. J. Bigley. Controlled through wiping contacts adjacent to trolley wheel.

1,123,931. Machine for Making Welded Chains. M. B. Ryan, Boston, Mass. Has link-forming and feeding mechanism, means for positioning the disconnected ends between the electrodes of the welding circuit, and a cam for closing the circuit.

1,123,942. Stereoscopic X-Ray System. H. C. Snook, Cynwyd, and E. W. Kelly, Philadelphia, Pa. Operated from alternating current through a step-up transformer and commutator.

1,123,962. Process of Hydrogenating Fats, Oils, and Waxes. T. B. Walker, Austin, Tex. Consists in discharging the oil in a spray with hydrogen gas against a heated body of catalytic material in presence of an electric discharge.

1,123,971. Distributer for Ignition Dynamos. H. H. Wixon, assignor to Stromberg Motor Devices Co., Chicago, Ill. Provided with rotatable contacts to form a testing gap in parallel with a fixed spark gap.

1,123,973. Automatic Train Stop. M. C. Wright, New York, N. Y. Electric brake-applicator and locomotive signal.

1,123,979. Telephone Attachment for Cars. M. J. Bartol, Beaverdale, Pa. Arms extending beneath the train engage telephone-line conductors along the track.

1,123,985. Insulating Material. F. Bölling, assignor of one-half to Prometheus Fabrik Elektrischer Koch- und Heizapparate Gesellschaft M. B. H., Frankfort-on-the-Main, Germany. Consists of mica flakes pasted together under high pressure by a flux containing boron, silicon and lead.

1,124,003. Electric Locomotive with Cable-Reeling Mechanism. D. T. Fisher, assignor to Jeffrey Mfg. Co. Has separate motor for winding the reels.

1,124,021. Impulse Transmitter. W. F. Hoffmann, assignor to Western Electric Co. Multiple telephone selecting key set.

1,124,022. Ignition for Multiple Cylinder Combustion Engines Having Irregular Order of Ignition. G. Honold, assignor to firm of Robert Bosch, Stuttgart, Germany. Ignition is at higher speed than regularly demanded by engine.

1,124,023. Electric Ignition System. G. Honold, assignor to firm of Robert Bosch. Produces retarded and advanced ignition sparks during the starting and running periods.

1,124,051. Projecting Lamp. C. A. Matisse and A. C. Matisse, New York, N. Y. Means for adjusting lamp and socket in the reflector.

1,124,055. Electric Water Level Indicator. W. E. Moorefield and A. J. Brady, Hinton, W. Va.; said Moorefield assignor of one-half of his right to G. L. Taylor. Light circuits controlled at various levels.

1,124,060. Test Guard for Automatic Switching Apparatus. J. N. Reynolds, assignor to Western Electric Co. Means for indicating all the circuits as busy while the telephone switch is operated by the motor.

1,124,072. Electromagnetic Track Brake. D. Storjohann, Immigrath, Germany. Mechanical details.

1,124,075. Electric Pocket Lamp. J. G. Swallow, New York. N. Y. For quickly connecting battery to lamp.

1,124,086. Controlling Means for Electric Motors. G. H. Whittingham and W. T. Holmes, assignors to Monitor Mfg. Co., Baltimore, Md. Has a pair of automatic rheostats connected alternately in the armature circuit.

1,124,105. Impulse Transmitter. W. M. Bruce, Jr., assignor to Western Electric Co. Modification of No. 1,124,021.

1,124,119. Telegraph Instrument. H. A. Emrick, Casey, Ill. Has a supplemental key connected across the circuit of the main key.

1,124,129. Means for Regulating Clocks by Hertzian Waves. G. A. Goodson, Minneapolis, Minn. Wireless is sent out by oscillation-generating set, which is started automatically shortly before the proper time.

1,124,133. Safety Fuse for Electric Circuits. H. C. Hershey, assignor to N-W Equipment Co., New York, N. Y. Cartridge fuse with sectional plugs.

1,124,137. Diaphragm Horn. M. R. Hutchinson, Deal Beach, N. J., assignor to Lovell-McConnell Mfg. Co. Motor-driven diaphragm actuator.

1,124,142. Speed-Dependent Motor Controlling Apparatus. S. H. Keefer; M. E. Keefer, administratrix of said S. H. Keefer, deceased, assignor to Niles-Bement-Pond Co., New York, N. Y. Motor circuit is automatically broken when armature current becomes excessive or speed too low.

1,124,169. Burglar Alarm for Safes. T. Prushey, Tacoma, Wash. Safe is surrounded by compressed-air casing, reduction of pressure in which closes alarm circuit.

1,124,179. Circuit-Breaker Tripping Apparatus. W. M. Scott, Radnor, Pa. Reverse-power three-phase circuit-breaker.

1,124,189. Motor Control System. G. H. Whittingham, assignor to Monitor Mfg. Co., of Baltimore City. Master switch controls two starters.

1,124,192. Electromagnetic Selecting Apparatus. G. L. Anders, London, England, assignor of one-half to W. Köttgen. Magnet armature constrained to act in tube.

1,124,194. Fuse. W. C. Banks, assignor to N-W Equipment Co., New York, N. Y. Special construction of terminal caps and end grips for cartridge fuse.

1,124,211. Electric Locomotive. F. C. Coseo, assignor to Jeffrey Mfg. Co. Has two cable reels driven by motor.

1,124,213. Incandescent Electric Lamp. H. Csanyi, assignor to Maxivolt Primary Battery Co., New York, N. Y. Safety lamp has circuit opened on fracture of glass window.

1,124,215. Illuminating and Sounding Sign or Indicator. J. A. Dempsey, New York, N. Y. Resembles clock which is electrically lighted through flasher and has sound producer.

1,124,230. Electric Fusible Cut Out. H. P. Liversidge, assignor to Pennsylvania Appliance Co., Philadelphia, Pa. Metallic receptacle for a compressed fluid has fusible extension, melting of which opens the circuit.

Reissue 13,858. Apparatus for Testing Storage-Battery Circuits. C. E. Beach, assignor to G. O. Knapp, New York, N. Y. Original No. 1,099,909, dated June 16, 1914. Voltmeter connected by special switches to discharging battery, to ground or to charging battery.